ASTOUNDING

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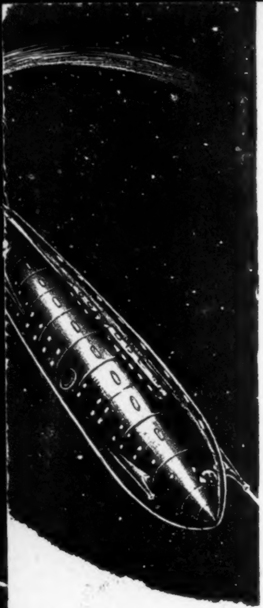
Science·fiction

NOV. '43

RECOIL

BY GEORGE O. SMITH

NOVEMBER · 1943



ASTOUNDING
SCIENCE FICTION

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Arithmetic and Empire

It was van Vogt's story "Storm" that started me thinking on the problem; this item would have appeared last month had it not been that the announcement of this new size became necessary. The problem is simple in statement—the governmental set-up for maintaining peace and order in a galactic empire.

At present, all theories of how planets are formed are lying in ruins. (It's interesting that, even before the discovery of the extra-solar planets, the various stellar-collision theories had been mathematically proven wrong; 61 Cygni C simply confirmed the fact.) We haven't any idea how planets come about, but *every star which we have been able to observe minutely enough to make the detection of a planet possible has shown planets.* I think it's fair to set up an hypothesis on the basis that all stars have planets; many stars have habitable worlds. Four hundred million planets capable of supporting human life, within this galaxy, is not stretching possibilities anywhere near the limits.

Then, given a fast interstellar drive, and, say five thousand years of time, what sort of human population might the galaxy develop?

When it comes to population increase, rabbits and guinea pigs have a reputation as experts; the reputation is somewhat undeserved—they simply have short generations. Man can do a very fine job of increasing the population when conditions warrant it, and there's some time allowed.

This planet, under present conditions, has a population of about two billions. With improved methods of producing food—you've perhaps noticed that item about making a meat-flavored, meatlike food from yeast, ammonia and sugar?—it could support some fifty billions without discomfort. Since a planet habitable for human kind will, of necessity, be Earthlike, an average population per planet of one billion would be conservative.

That gives the tidy total of four hundred million billion people. Like the number of light-waves in a mile, the number doesn't have much emotional meaning—it remains a "4," which we can understand, followed by a string of zeros which quickly cease to mean anything real or understandable.

But this part of it does become understandable. Such an empire would have to have a home-rule governmental system, with local area governments in each city, up through continent governments, world governments, and system governments. Van Vogt suggested in "Storm" that some central government would be essential to keep individual planets, systems, sectors, and quadrants from warring amongst themselves. It seems reasonable. Let's see what sort of affair that would be.

I don't believe that the United States Federal government could be operated effectively by one hundred thirty men—including the whole set-up from President down through and including the Army, Navy and Post Office clerks. One civil servant per million people is impossibly small, percentagewise, to be effective. That's a figure that must be expanded.

But our galactic empire government must, then, have more than that microscopic percentage of one-in-a-million, must have more than an impossibly scant *four hundred billion* Federal employees.

Perhaps, if Earth were made one solidly built-up capital city-world, supported by the microscopic taxes collected from the individuals of the empire, by the goods shipped in from other, producing worlds, this one planet could serve as the empire's governing world. Otherwise, it would take some two hundred planets to support the government's functionaries.

Incidentally, a congress made up of representatives each of whom represented a billion individuals would be a more populous affair than the North American continent now is—twice over! To have a representative body of manageable size, each legislator would have to represent some million billion people.

The one-in-a-million figure of governmental employees is certainly too small; there will be some compromise figure between our present-day over-high percentage of government workers—after all, the problem of governing populations of more than one hundred million people democratically is less than fifty years old—and that too-small figure.

The availability of really fast communications will aid a lot *too*. As long as human nature remains roughly comparable to what it is today, a face-to-face, person-to-person conference will continue to be more solidly, definitely effective—and it takes time to go from point to point. Since most governmental conferring is within the capitol, fast communications—say van Vogt's trick walls—would help fewer people to accomplish more. But all this deals only with the central government. How many people would be engaged in *all* governmental work in an empire of 400,000,000,000,000,000 people, including town, city, county, district, continent, world, stellar-system, sector, quadrant and galactic governments?

Galactic empire has been glibly considered fairly frequently in science-fiction. But—has anyone any workable suggestions for a galactic government? The Editor.

Recoil

by George O. Smith

Illustrated by Orban

***THE** near impossibility of hitting a spaceship with a shell has been discussed. **But** even an electron gun would, curiously, tend to defeat itself! The weapon protects the target!*

Walter Franks sat in the director's office; his feet on the director's desk. He was smoking one of the director's cigarettes. He was drinking the director's liquor, filched shamelessly from the director's private filing cabinet where it reposed in the drawer marked "S." Drawer "B" would have given beer, but Walt preferred Scotch.

He leaned forward and tossed the director's cigarette into the director's wastebasket and then he pressed the button on the desk and looked up.

But it was not the director's secretary who entered. It was his own, but that did not disturb Franks. He knew that the director's secretary was off on Mars enjoying a honeymoon with the director.

Jeanne entered and smiled. "Must you call me in here to witness you wasting the company's time?" she asked in mock anger.

"Now look, Jeanne, this is what Channing does."

"No dice. You can't behave as Don Channing behaves. The reason is my husband."

"I didn't call to have you sit on my lap. I want to know if the mail is in."

"I thought so," she said. "And so I brought it in with me. Anything more?"

"Not until you get a divorce," laughed Franks.

"You should live so long," she said with a smile. She stuck her tongue out at him.

Walt thumbed his way through the mail, making notations on some, and setting others aside for closer reading. He came to one and tossed it across the desk at Jeanne. She took the message and read:

Dear Acting Director:
Having a wonderful honeymoon; glad you aren't here!
Don and Arden.

"Wonderful stuff, love," smiled Franks.

"It is," agreed Jeanne. A dreamy look came into her eyes.

"Scram, Jeanne. There are times when you can't work worth a darn. Usually when you're thinking of that husband of yours. What's he got that I haven't?"

"Me," said Jeanne slyly. She arose and started for the door. "Oh," she said, "I almost forgot. Warren phoned up and said that the turret is ready for a try-out."

"Fine," said Walt. "Swell." He unfolded himself from the chair with alacrity and almost beat the girl to the door.

"My," she laughed, "you can move after all."

"Sure," he grinned. "Now I have something for which to live."

"I hope it's worth it. You've sunk a lot of change into that bughouse."

"I know, but we can stand it. After all, since Don took over this affair, Interplanetary Communications is an up and running business. We're out of the Government subsidy class now, and are making money. If this works, we'll make more. It's worth a gamble."

"What are you trying to build?" asked Jeanne.

"Why, since this business of contacting ships-at-space has become so universally liked, we have a tough time keeping ships in the mobile beam. That's because they are always ducking out of the way of loose meteorites and stuff, and that screws up their course. We can't see 'em, and must take their position on the basis of their expected course. We never know whether we hit 'em until they land.

"Now I've been trying to devise a space gun that will blast meteors directly instead of avoiding them by coupling the meteor detector to the autopilot."

"Gonna shoot 'em out of existence?"

"Not exactly. Popping at them with any kind of a rifle would be like trying to hit a flying bird with a spitball. Look, Jeanne, top speed on the run from Mars to Terra at major opposition is up among the thousands of miles per second at the turnover. A meteor itself may be blatting along at fifty miles per second. Now a rifle, shooting a projectile at a few thousand feet per second would be useless. You'd have the meteor in your lap and out of the other side while the projectile is making up its mind to move forward and relieve the pressure that is building up behind it due to the exploding powder.

"I've designed an electron gun. It is a superpowered, oversized edition of the kind they used to use in kinescope tubes, oscilloscope tubes, and electron microscopes. Since the dingbat is to be used in space, we can leave the works of the gun open and project a healthy stream of electrons at the offending object without their being slowed and dispersed by an impending atmosphere."

"But that sounds like shooting battleships with a toy gun."

"Not so fast on the objections, gal," said Franks. "I've seen a simple oscilloscope tube with a hole in the business end. It was burned right through a quarter inch of glass because the fellows were taking pix and had the intensity turned up high. The sweep circuit blew a fuse and the beam stopped on one spot. That was enough to puncture the screen."

"I see. That was just a small affair?"

"A nine-inch tube. The electron gun in a nine-inch kinescope tube is only about four inches long and three quarters of an inch in diameter. Mine, out there in the turret, is six feet in diameter and thirty feet long. I can fire out quite a bundle of electrons from a tube of that size."

"It sounds as though you mean business."

"I do. This is the right place to do research of that kind. Out here on Venus Equilateral, we're in a natural medium for an electron gun, and we've the power requirements to run it. I can't think of any place in the System that offers better chances."

"When are you going to try it out?"

"As soon as a meteor comes over the pike, as long as Warren says we're ready."

Jeanne shook her head. "I wish Channing were here. Things are wild enough when you are both working on something screwball, but I could get scared something fierce at the thought of either one of you working without the other."

"Why?"

"You two sort of act as balance wheels to one another's craziness. Oh, don't take that word to heart. Everybody on the Relay Station thinks the world of you two. myself included. *Craziness* in this case means a sort of friendly description of the way your brains work. Both of you dash off on tangents now and then, and when either one of you get off the beam, the other one seems to swing the weight required to bring the lost one back to the fold."

"That's a real mess of mixed metaphors, Jeanne. But I am going to surprise Don hairless when he gets back here and finds that I've done what people claimed couldn't be done. I'm going to be the bird whose bust sits in the Hall of Fame in between Edison, Einstein, Alexander Graham Bell, S. F. B. Morse, and—"

"Old Man River, Jack Frost, and Little Boy Blue," laughed Jeanne. "I hope it's not a bust, Walt."

"You mean I should have a whole statue?"

"I mean, I hope your dream is not a bust!"

Jeanne left, with Walt right behind her. Franks did not remain at the desk, however, but made his way from the office level to the outer skin of the Relay Station by way of a not-often-used stairway that permitted him to drop to the outer skin. Above his head were the first levels of apartmental cubicles occupied by the personnel of Venus Equilateral. Out here, Walt had but a scant thickness of steel between him and the void of space.

His pathway was strewn with pipe, cable, and storage tanks. He passed a long-forgotten project and paused to reminisce over the days when a meteor shower had caused them some concern by puncturing the skin twice. The installation of a sponge elastomer under compression in this space had been stopped when a brilliant astrophysicist proved to Channing—then a supervisor in the operations laboratory—that the chances of being dangerously punctured were practically nil, and that the actual puncturing had done nothing but make people uncomfortably leery.

Then Franks came to a room built from outer skin to inner skin and about fifty feet in diameter. He unlocked the door with a key on his watch chain, and entered. Jim Warren was waiting for him.

"Hi, ordnance expert. We're ready as soon as they are."

"How's she working?"

"I should know? We've been squirting ropes of electrons out to blank space for hours. She gets rid of them all right. But have we done any good? I dunno."

"Not a meteor in sight, I suppose."

"The detector hasn't blinked once. But when she does, your electron gun will follow the darned thing until it gets a half thousand miles out of sight, or will pick it up a thousand miles before it gets here."

"That sounds fine. It's a good thing that we don't have to swivel that mess of tube around a whole arc in actual use. It would take too long. But we'll put one in each upper quadrant of a spaceship and devise it so that its working arc will be small enough to make it work. Time enough to find that out after we know if it works."

"That's something that I've been wondering about," said Warren. "Why didn't we build a small one out here and evacuate the skin for a few hundred feet? We could set up a few chunks of iron and squirt electrons at 'em."

"And have the folks upstairs screaming? Nope. I've a hunch that when this beam hits something hard, it will create quite a ruckus. It would be fine to have a hunk blown right out of the skin, wouldn't it?"

"Guess you're right," admitted Warren.

The meteor alarm flashed, and a bell dinged once.

"Here's our chance," snapped Walt. "We've about fifteen seconds to work on this one."

He looked out of a tiny window, and saw that the big tube had lined up with the tiny model that was a monitor for the big tube. He sighted through the model, which in itself was a high-powered telescope, and he saw the jagged meteor rushing forward at an angle to the Station. It would miss by miles, but it would offer a good target.

"Cathode's hot," said Warren.

Walt Franks grasped the power switch and thrust it down part way. Meters leaped up their scales and from somewhere there came the protesting whine of tortured generators. Through the window, nothing very spectacular was happening. The cathode glowed slightly brighter due to the passage of current through its metal and out of the coated surface. But the electrostatic stresses that filled the gaps between the accelerator and focusing anodes was no more visible than the electricity that runs a toy motor. Its appearance had not changed a bit, but from the meters, Walt Franks knew that megawatts of electronic power, in the shape of high-velocity electrons, was being pored from the cathode; accelerated by the ring anodes; and focused to a narrow beam by the focusing anodes. And from the end of the framework that supported these anodes, a cylinder of high-velocity electrons poured forth, twelve inches in diameter.

Through the telescope, the meteor did not seem to be disturbed. It exploded not, neither did it melt. It came on inexorably, and if the inanimate nickel and iron of a meteor can be said to have such, it came on saucily and in utter disregard for the consequences.

Frantically, Walt cranked the power up higher and higher, and the lights all over the Station dimmed as the cathode gun drained the resources of the Station.

Still no effect.

Then in desperation, Walt slammed the power lever down to the bottom notch. The girders strained in the tube from the terrific electrostatic stresses, and for a second, Walt was not certain that the meteor was not finally feeling the effects of the electron bombardment.

He was not to be sure, for the experiment came to a sudden stop

An insulator arced where it led the high-voltage lines that fed the anodes through the wall. Immediately it flashed over, and the room filled to the brim with the pungent odor of burning insulation. A medium-voltage anode shorted to one of the high-voltage anodes, and the stress increased in the tube. It broke from its moorings, this low-voltage anode, and it plunged backward, down the tube toward the cathode. It hit, and it was enough to jar the whole tube backward on its gimbals.

The shock warped the mounting of the tube, and it flexed slightly, but sufficiently to bring the farthermost and highest voltage anode into the electron stream. It glowed redly, and the secondary emission raved back through the series of electrodes, heating them and creating more warpage.

Then the pyrotechnic stopped. Great circuit breakers crashed open up in the power room hundreds of feet above them, high in the Station.

Walt Franks looked out through the window at the tangled mess that had been a finely machined piece of equipment. He saw the men looking quizzically at him as he turned away from the window, and with a smile that cost him an effort, he said: "All right, so Marconi didn't get WLW on his first try, either. Come on, fellows, and we'll clean up this mess."

With the utter disregard that inanimate objects show toward the inner feelings of the human being, the meteor alarm blinked again and the bell rang. The pilot tube swiveled quickly to one side, lining up with the spot in the celestial globe of the meteor detector. Out in the turret that housed the big tube, motors strived against welded commutators and the big tube tried to follow.

Walt looked at the pointing tube and said: "All right! Go ahead and point!"

Don Channing smiled at Arden. "Mrs. Channing," he said, "must you persist in keeping me from my first love?"

Arden smiled winningly. "Naturally. That's what I'm here for. I intend to replace your first love entirely and completely."

"Yeah," drawled Don, "and what would we live on?"

"I'll permit you to attend to your so-called first love during eight hours every day, providing that you remember to think of me every half-hour."

"That's fine. But you really aren't fair about it. We were on Terra for two weeks. I was just getting interested in a program outlined by one of the boys that works for Interplanet, and what happened? You hauled me off to Mars. We stayed for a week at the Terraland Hotel at Canalopsis and the first time that Keg Johnson came to see us with an idea and a sheaf of papers, you rushed me off to Lincoln Head. Now I'm scared to death that some guy will try to open a blueprint here; at which I'll be rushed off to the Palanortis Country until someone finds us there. Then it'll be the Solar Observatory on Mercury or the Big Glass on Luna."

Arden soothed Don's feelings by sitting on his lap and snuggling. "Dear," she said in a voice that positively dripped, "we're on a honeymoon, remember?"

Don stood up, dumping Arden to the floor. "Yeah," he said, "but this is the highest velocity honeymoon that I ever took!"

"And it's the first one I was ever on where the bridegroom took more time admiring beam installations than he took to whisper sweet nothings to his gal. What has a beam transmitter got that I haven't got?"

"One: Its actions can be predicted. Two: It can be controlled. Three: It never says anything original, but only repeats what it has been told. Four: It can be turned off."

Arden caught Don on the point of the chin with a pillow and effectively smothered him. She followed her slight advantage with a frontal attack that carried him backward across the bed, where she landed on top viciously and proceeded to lambaste him with the other pillow.

It was proceeding according to plan, this private, good-natured war, until a knock on the door caused a break in operations. Channing struggled out from beneath Arden and went to the door trying to comb his hair by running spread fingers through it. He went with a sense of failure caused by Arden's quiet laugh and the statement that he resembled a bantam rooster.

The man at the door apologized, and then said: "I'm Doug Thomas of the *Triworld News.*"

"Come in," said Don, "and see if you can find a place to sit."

"Thanks."

"I didn't know that *Triworld News* was interested in the wedded life of the Channings. Why doesn't *Triworld* wait until we find out out about it ourselves?"

"*Triworld* does not care to pry into the private life of the newly wed Channing family," laughed Doug. "We, and the rest of the System do not give a damn whether Mrs. Channing calls you Bunny-bit or Sugar-pie—"

"Sweetums," corrected Arden with a gleam in her eye.

"—we've got something big to handle. I can't get a thing out of the gang at Canalopsis, they're all too busy worrying."

"And so you came here? What do you expect to get out of us? We're not connected in any way with Canalopsis."

"I know," said Doug, "but you do know space. Look, Channing, the *Solar Queen* has been missing since yesterday morning!"

Don whistled.

"See what I mean? What I want to know is this: What is your opinion on the matter? You've lived in space for years, on the Relay Station, and you've had experience beyond anybody I can reach."

"Missing since yesterday morning," mused Channing. "That means trouble."

"That's what I thought. Now if you were running the spaceport at Canalopsis, what would your own private opinion be?"

"I don't know whether I should speak for publication," said Don.

"It won't be official. I'll corroborate anything you say before it is printed, and so on. But I want an unofficial opinion, too. If you want this withheld, say so, but I still want a technical deduction to base my investigation on. I don't understand the ramifications and the implications of a missing ship. It is enough to make Keg Johnson's hair turn gray overnight, though, and I'd like to know what is so bad before I start to turn stones."

"Well, keep it off the record until Canalopsis gives you the go-ahead. I can give you an opinion, but I don't want to sound official."

"O. K. Do you suppose she was hit by a meteor shower?"

"Doubt it like the devil. Meteor detectors are many and interconnected on a spaceship, as well as being alarmed and fused to the nth degree. Any trouble with them will bring a horde of ringing bells all through the ship which would bring the personnel a-running. They just don't go wrong for no reason at all."

"Suppose that so many meteors came from all directions that the factors presented to the autopilot—"

"No dice. The possibility of a concentration of meteors from all directions all about to pass through a certain spot in space is like betting on two Sundays in a row. Meteors don't just run in all directions, they have a general drift. And the meteor detecting equipment would have been able to pick up the centroid of any group of meteors soon enough to lift the ship around it. Why, there hasn't been a ship hit by a meteor in ten years."

"But—"

"And if it had been," continued Channing, "the chances are more than likely that the ship wouldn't have been hit badly enough to make it impossible to steer, or for the crew to shoot out message tubes which would have landed on Canalopsis."

"Suppose that the ship ducked a big shower and it went so far out of course that they missed Mars?"

"That's out, too," laughed Channing.

"Why?"

"A standard ship of space is capable of hitting it up at about 4-G all the way from Terra to Mars at major opposition and end up with enough power and spare cathodes to continue on to Venus in quadrature. Now the velocity of the planets in their orbits is a stinking matter of miles per second, while the top speed of a ship in even the shortest passage runs up into four figures per second. You'd be surprised at what velocity you can attain at 1-G for ten hours."

"Yes?"

"It runs to slightly less than two hundred and fifty miles per second, during which you've covered only four million miles. In the shortest average run from Venus to Terra at conjunction, a skimpy twenty-five million miles, your time of travel is a matter of twenty-five hours add, running at the standard 2-G. Your velocity at turnover—or the halfway point where the ship stops going up from Terra and starts to go down to Venus—is a cool five hundred miles per second. So under no condition would the ship miss its objective badly enough to cause its complete loss. Why, this business is run so quickly that were it not for the saving in time and money that amounts to a small percentage at the end of each flight, the pilot could head for his planet and approach the planet asymptotically."

"You know what you're doing, don't you?" asked the reporter.

"I think so."

"You're forcing my mind into accepting something that has never happened before, and something that has no basis for its—"

"You mean piracy? I wonder. We've all read tales about the Jolly Roger being painted on the side of a sleek ship of space while the pirate, who at heart is a fine fellow though uninhibited, hails down the cruiser carrying radium. He swipes the stuff and kisses all the women whilst menacing the men with a gun hand full of searing, coruscating, violently lethal ray pistol. But that sounds fine in stories. The trick is tougher than it sounds, Thomas. You've got to catch your rabbit first."

Meaning?"

"Meaning that finding a ship in space to prey upon is somewhat less difficult than juggling ten billiard balls whilst riding a horse blindfolded. Suppose you were to turn pirate. This is what would happen:

"You'd get the course of the treasure ship from the spaceport, fine and good, by resorting to spies and such. You'd lie in wait out there in the blackness of space, fixing your position by the stars and hoping that your error in fix was less than a couple of thousand miles. It's more likely to be a hundred thousand miles, though. The time comes. You look to your musket, sharpen your sword, and see to the priming of your Derringers that are thrust into the red sash at your waist. You are right on the course, due to your brilliant though lawless navigator who was tossed out of astrogator's school for filching the teacher's whiskey. Then the treasure ship zoops past at a healthy hundred miles per second and you decide that since she is hitting it up at 2-G, you'd have to start from scratch at a heck of a lot better to catch her within the next couple of light years.

"So you give up, join the Congregational Church and pass the collection plate every Sunday."

"But suppose you took the course as laid and applied the same acceleration? Suppose you followed on the heels of your quarry until you were both in space? You could do it then, couldn't you?"

"Gosh," said Channing, "I never thought of that. That's the only way a guy could pirate a ship—unless he planted his men aboard and they mutinied."

"Then it might be pirates?"

"It might be," admitted Channing. "It'd have to occur near beginning or end, of course, though. I can't think of anything safer than being shot at out of a gun of any kind while both crates are hitting it up at a couple of hundred miles per second and at a distance of a few miles apart. It would be all right if you were both running free, but at 2-G acceleration, you'd have to do quite a bit of ballistic gymnastics to score a hit."

"Or run in front of your quarry and sow a bouquet of mines."

"Except that the meteor detector would show the position of the pirate craft in the celestrial globe and the interconnecting circuits would cause the treasure ship to veer off at a sharp angle. Shucks, Doug, this thing has got too many angles to it. I can't begin to run it off either way. No matter how difficult it may sound, there are still ways and means to do it. The one thing that stands out like a sore thumb is the fact that the *Solar Queen* has turned up missing. Since no inanimate agency could cause failure, piracy is the answer."

"You're sure of that?"

"Not positive. There are things that might cause the ship to founder. But what they are depend upon too many coincidences. It's like hitting a royal flush on the deal, or filling a full house from two pair."

"Well, thanks, Channing. I'm heading back to Canalopsis right now. Want to come along?"

Channing looked at Arden, who was coming from the dressing room carrying her coat and he nodded. "The gal says yes," he grinned. "Annoy her until I find my shoes, will you?"

Arden wrinkled her nose at Don. "I'll like that," she said to Doug.

The trip from Lincoln Head to Canalopsis was a fast one. Doug Thomas drove the little flier through the thin air of Mars at a breakneck speed and covered the twelve hundred miles in just shy of two hours. At the spaceport, Channing found that he was not denied the entrance as the reporter had been. He was ushered into the office of Keg Johnson in record time, and the manager of the Canalopsis Spaceport greeted Don with a worried expression on his face.

"Still gone," he said cryptically. "Like the job of locating her?"

Don shook his head with a sympathetic smile. "Like trying to find a grain of sand on a beach—a specified grain, I mean. Wouldn't know how to go about it."

Keg nodded. "I thought as much. That leaves her out of the picture. Well, up to now space travel has been about as safe as spending the evening in your easy-chair. Hello, Arden, how's married life?"

"Can't tell yet," she said with a twinkle. "I've got to find out whether I can break him of a dozen bad habits before I'll commit myself."

"I wish you luck, Arden, although from that statement, it's Don that needs the luck."

"We came to see if there was anything we could do about the *Solar Queen*," offered Channing.

"What can anybody do?" asked Keg with spread hands. "About all we can do is to put it down in our remembrances and turn to tomorrow. Life goes on, you know," said

Keg in a resigned tone, "and either we keep up or we begin to live in the past. Are you going to stay here for a day or two?"

"Was thinking about it," said Don.

"Well, suppose you register at the Terraland and meet me back here for lunch. If anything occurs, I'll shoot you a quickie." Keg looked at his watch and whistled. "Lordy," he said ruefully. "I didn't know how late it was. Look, kids, I'll run you downtown myself, and we'll all have lunch at the Terraland. How's that?"

"Sounds better," admitted Channing. "My appetite, you know."

"I know," laughed Arden. "Come on, meat-eater, and we'll peel a calf."

It was during lunch that a messenger raced into the dining room and handed Keg a letter. Keg read, and then swore roundly. He tossed the letter across the table to Don and Arden.

To the Operators of all Spacelines:

It has come to my attention that your ships require protection. The absence of the *Solar Queen* is proof enough that your efforts are insufficient to insure the arrival of a spaceship at its destination.

I am capable of offering protection at the reasonable rate of one dollar solarian for every gross ton, with the return of ten dollars solarian if any ship fails to come through safely. I think that you may find it necessary to subscribe to my insurance, since without my protection I cannot be responsible for failures.

ALLISON (HELLION) MURDOCH.

"Why the dirty racketeer," stormed Arden. "Who is he, anyway?"

"Hellion Murdoch is a man of considerable ability as a surgeon and a theoretical physicist," explained Don. "He was sentenced to the gas chamber ten years ago for trying some of his theories out on human beings without their consent. He escaped with the aid of fifteen or twenty of his cohorts who had stolen the *Hippocrates* right out of the private spaceport of the Solarian Medical Research Institute."

"And they headed for the unknown," offered Keg. "Wonder where they've been for the last ten years."

"I'll bet a hat that they've been in the Melapalan Jungle, using the machine shop of the *Hippocrates* to fashion guns. That machine shop was a dilly, if I remember correctly."

"It was. The whole ship was just made to be as self-sustaining as it could be. They used to run all over the System in it, you know, chasing bugs. But look, Don, if I were you, I'd begin worrying about Venus Equilateral. That's where he'll hit next."

"You're right. But what are you going to do?"

"Something that will drive him right out to the Relay Station," said Keg in a sorrowful tone. "Sorry, Don, but when I put an end to all space shipping for a period of six weeks, Hellion Murdoch will be sitting in your lap."

"He sure will," said Channing nervously. "Arden, are you willing to run a gantlet?"

"Sure," she answered quickly. "Are you sure that there will be danger?"

"Not too sure, or I wouldn't take you with me. Unless Murdoch has managed to build himself a couple of extra ships, we've got a chance in three that he'll be near one of the other two big spaceports. So we'll slide out of here unannounced and at a peculiar time of day. We'll load up with gravanol and take it all the way to the Station at 6-G."

"He may have two or three ships," said Keg. "A man could cover all the standard space shipping in three, and he might not have too bad a time with two, especially if he were only out looking for those which weren't paid for. But, look, I wouldn't check out of the Terraland if I were you. Keep this under cover. Your heap is all ready to take sky from Canalopsis Spaceport and you can leave directly."

"Hold off on your announcement as long as possible," Don asked Keg.

Johnson smiled and nodded. "I'll give you time to get there anyway. "But I've no control over what will be done at Northern Landing or Mojave. They may kick over the traces."

"Arden, we're moving again," laughed Don. "Keg, ship us our duds as soon as this affair is cleared up." Channing scribbled a message on the back of Murdoch's letter. "Shoot this off to Walt Franks, will you? I won't wait for an answer, that'll take about fifty minutes, and by that time I'll have been in space for twenty."

They paused long enough to stop at the nurse's office at the spaceport for a heavy shot of gravanol and a thorough bracing with wide adhesive tape. Then they made their way to the storage space of the spaceport where they entered their small ship. Channing was about to send the power lever home when the figure of Keg Johnson waved him to stop.

Keg ran up to the space lock and handed in a paper.

"You're it," he said. "Good luck, Channings."

It was another message from Hellion Murdoch. It said, bluntly:

> To Donald Channing,
> Director of Communications:
>
> Considerable difficulty has been experienced in transmitting messages to the interested parties. I desire a free hand in telling all who care, the particulars of my insurance.
>
> Since your Relay Station is in a position to control all communications between the worlds, I am offering you the option of either surrendering the Station to me, or of fighting me for its possession. I am confident that you will see the intelligent course; an unarmed station in space is no match for a fully armed and excellently manned cruiser.
>
> Your answer will be expected in five days.
>
> ALLISON (HELLION) MURDOCH.

Channing snarled and thrust the power lever down to the last notch. The little ship leaped upward under $5\frac{1}{2}$-G, and was gone from sight in less than a minute.

Arden shook her head. "What was that message you sent to Franks?" she asked.

"I told him that there was a wild-eyed pirate on the loose, and that he might make a stab at the Station. We are coming in as soon as we can get there and to be on the lookout for us on the landing communications radio, and also for anything untoward in the nature of space vessels."

"Then this is not exactly a shock," said Arden, waving the message from Murdoch.

"Not exactly," said Channing dryly. "Now look, Arden, you go to sleep. This'll take hours and hours, and gabbing about it will only lay you out cold."

"I feel fine," objected Arden.

"I know, but that's the gravanol, not you. The tape will keep you intact, and the gravanol will keep you awake without pain or nausea. But you can't get something for nothing, Arden, and when that gravanol wears off, you'll spend ten times as long with one tenth of the trouble you might have had. So make it easy for yourself now and later you'll be glad that you aren't worse."

The sky blackened, and Channing knew that they were free in space. Give them another fifteen minutes and the devil himself couldn't find them. With no flight plan scheduled and no course posted, they might as well have been in the seventeenth dimension. As they emerged from the thin atmosphere, there was a fleeting flash of fire from several miles to the East, but Channing did not pay particular attention to it. Arden looked through a telescope, and said that she thought that she saw a spaceship circling, but that she could not be sure.

Whatever it was, nothing came of it.

The trip out to the Station was a monotonous series of uneventful hours, proceeding along one after the other. They dozed and slept most of the time, eating sparingly and doing nothing that was not absolutely necessary.

Turnabout was accomplished and then the deceleration began, equally long and equally monotonous. It was equally inactive. Channing tried to plan, but it failed because he could not plan without talking and discussing the affair with his men; too much depended upon their co-operation. He fell into a morose futile feeling that made itself evident in grousing; Arden tried to jolly him, but Don's usually bubbling spirit was doused too deep Also, Arden herself was none too happy, and she failed to convince herself, which is necessary before one can convince anyone else of anything.

Then they sighted the Station, and Channing's ill spirit left. A man of action, what he hated most was the no-action business of just sitting in a little capsule of steel waiting for the Relay Station to come up out of the sky below. Once it was sighted, Channing could foresee action, and his grousing stopped

They zipped past the Station at a distance of ten miles, and Channing opened the radio.

"Walt Franks! Wake up, you slumberhead."

The answer came inside of a half minute. "Hello, Don. Who's asleep?"

"Where are you? In Joe's?"

"Joe has declared a drought for the duration," said Franks with a laugh. "He thinks we can't think on Scotch."

"We can't. Have you seen the boys?"

"Murdoch's crew? Sure, they're circling at about five miles, running around in the plane of the ecliptic. Keep running on the colure and the chances are that you won't even see 'em. But, Don, they can hear us!"

"How about the landing stage at the South end?"

"There are two of them running around the Station at different heights from South to North. The third is circling in a four-mile circle on a plane five miles South of the Station. We've picked up a few HE shells, and I guess that, if you try to make a landing there, you'll be shot to bits. That devil is using the meteor detector for a gun pointer."

"Walt, remember the range finder?"

"Y'mean the one we used to find the *Empress?*"

"Uh-huh. Rig it without the adjustable mirror. Get me? D'you know what I want to do?"

"Yop. All we have to do is to clear away some of the saw grass again. Not too much, though, because it hasn't been too long since we cut it before. I get you all right."

"Fine. How soon?"

"I'm in the beam control dome North. I've got a portable mike, and I walk over to the adjustable mirror and begin to tinker with the moving screws. *Ouch!* I've skun me a knuckle. Now look, Don, I'm going inside and crack the passage end. I've broadcast throughout the Station that this is to be cracked, and the men are swarming all over the axis of the Station doing just that. Come a-running!"

Channing circled the little ship high to the North and came down toward the axis of the Station. He accelerated fiercely for a portion of the time, and then made a slam-bang turnabout that caused some of the plates to complain. A pilot light on the instrument panel gleamed, indicating that some of the plates were strained and that the ship was leaking air. Another light lit, indicating that the automatic pressure control was functioning, and that the pressure was maintained, though it might not be too long.

Then in deceleration, Channing fought the ship on to a die-straight line with the open door at the North end. He fixed the long, long passageway in the center of his sights, and prayed.

The ship hit the opening squarely, and only then did their terrific speed become apparent. Past bulkhead after bulkhead they drove, and a thin scream came to their ears as the atmosphere down in the bowels of the Station was compressed by the tiny ship's passage.

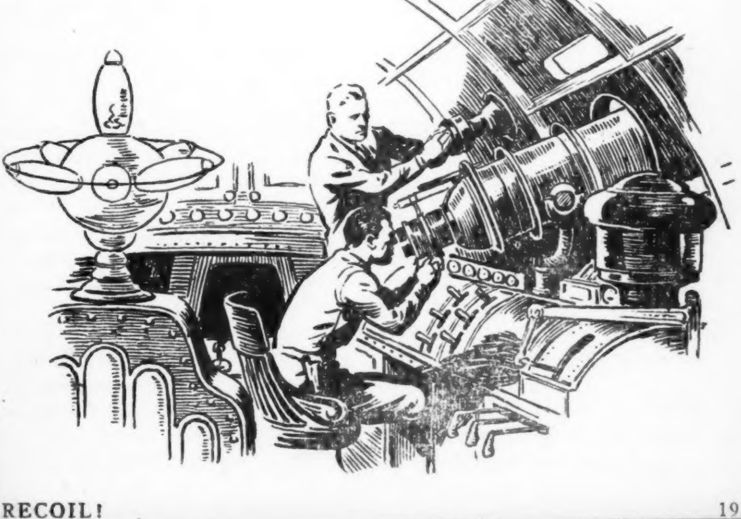
Doors slammed behind the ship as it passed, and air locks were opened, permitting the Station's center to fill to its normal pressure once more.

Then the rocketing ship slowed. Channing saw a flash of green and knew that the Martial saw grass was halfway down the three-mile length of the Station. He zipped past storeroom and rooms filled with machinery, and then the ship scraped lightly against one of the bulkheads.

It caromed from this bulkhead against the next, hitting it in a quartering slice. From side to side the ship bounced, crushing the bulkheads and tearing great slices from the flanks of the ship.

It slowed, and came to rest against a large room full of packing cases, and was immediately swarmed over by the men from the Relay Station.

They found Channing partly conscious. His nose was bleeding, but otherwise he seemed all right. Arden was completely out, though a quick check by the Station's medical staff assured Don that she would be all right as soon as they gave her a work-out. He was leaving the center of the Station when Franks came puffing up the stairway from the next lowest level.



"Gosh," he said. "It's a real job trying to guess where you stopped. I've been hitting every hundred feet and asking. Well, that was one for the book."

"Yeah," groaned Don. "Come along, Walt. I want a shower. You can give the résumé of the activities whilst I'm showering and trying to soak this adhesive off. Arden, lucky girl, will be unconscious when the doc rips it off, but I never liked the way they remove tape."

"There isn't much to tell," said Franks. "But what there is, I'll tell you."

Channing was finishing the shower when Walt mentioned that it was too bad that they hadn't started his electron gun a few weeks sooner.

Don shut off the water, fumbled for a towel, and said: "What?"

Franks repeated.

Again Channing said: "What? Are you nuts?"

"No. I've been tinkering with an idea of mine. If we had another month to work on it, I think we might be able to clip Murdoch's ears."

"Just what are you using in this super weapon, chum?"

Franks explained.

"Mind if I put in an oar?" asked Channing.

"Not at all. So far we might be able to fry a smelt at twenty feet, or we could cook us a steak. But I haven't been able to do a thing yet. We had it working once, and I think we heated a meteor somewhat, but the whole thing went blooey before we finished the test. I've spent the last week and a half fixing the thing up again, and would have tried it out on the next meteor, but your message brought a halt to everything but cleaning up the mess and making ready just in case we might think of something practical."

"I'll put in my first oar by seeing the gadget. Wait 'til I find my pants, and I'll go right along."

Don inspected the installation and whistled. "Not half bad, sonny. Not half bad."

"Except that we haven't been able to make it work."

"Well, for one thing, you've been running on the wrong track. You need more power."

"Sure," grinned Walt. "More power, he says. I don't see how we can cram any more soup into this can. She'll melt."

"Walt, what happens in a big gun?"

"Powder burns; expanding products of combustion push—"

"Functionally, what are you trying to accomplish? Take it on the basis of a solid shot, like they used to use back in the sailing ship days."

"Well," said Walt thoughtfully, "I'd say they were trying to heave something large enough to do damage."

"Precisely. Qualifying that statement a little, you might say that the projectile transmits the energy of the powder charge to its objective."

"Right," agreed Walt.

"And it is possible to transmit that energy mechanically. I think if we reason this idea out in analogy, we might be able to do it electrically. First, there is the method. There is nothing wrong with your idea, functionally. Electron guns are as old as radio. They—"

The door opened and Arden entered. "Hi, fellows," she said. "What's cooking?"

"Hi, Arden. Like marriage?"

"How long do people have to be married before people stop asking that darned fool question?" asked Arden.

"O. K., how about your question?"

"I meant that. I ran into Warren who told me that the brains were down here tinkering on something that was either a brilliant idea of an equally brilliant flop—he didn't know which. What goes?"

"Walt has turned Buck Rogers and is now about to invent a ray gun."

"No!"

"Yes!"

"Here's where we open a psychopathic ward," said Arden sadly. So far, Venus Equilateral is the only community that hasn't had a village idiot. But no longer are we unique. Seriously, Walt?"

"Sure enough," said Channing. "He's got an idea here that may work with a little tinkering."

"Brother Edison, we salute you," said Arden. "How does it work?"

"Poorly. Punk. Lousy."

"Well, sound recording has come a long way from the tinfoil cylinder that scratches out: 'Mary had a little lamb!' And transportation has come along swell from the days of sliding sledges. You may have the nucleus of an idea, Walt. But I meant its operation instead of its efficiency."

"We have an electron gun of super size," explained Walt. "The cathode is a big affair six feet in diameter and capable of emitting a veritable storm of electrons. We accelerate them by means of properly spaced anodes of the proper voltage level, and we focus them into a nice bundle by means of electrostatic lenses—"

"Whoa, Tillie. You're talking like the Venerable Buck himself. Say that in language, please."

"Well, we work at swords' points whenever we try to accelerate electrons to high speeds and focus them at the same time," said Walt. "A voltage gradient will cause electrons to change their course like a lens, and with the usual trouble with inanimate things, it works the wrong way. In order to accelerate the electrons emitted from the cathode, they are subjected to the attraction of an anode which is operating at a high positive potential. The electrons leave the cathode, and as they are attracted by the positive anode, they begin to move.

"Now it is common to speak of the velocity of an electron by stating the quantity of volts that the electron has fallen through. The higher the voltage difference between cathode and anode, the faster the electron will go.

"But the stream of electrons will be diverged if it falls through a field of increasing positive potential. In order to bring the stream to a focus, we must follow the first anode with another anode of a potential less than the first anode but still higher than the cathode. That bollixes up the works. It focuses the stream and slows it at the same time. So we follow this anode with another high positive electrode and speed them up again, and then focus them and so on until we get the required velocity. These anodes are shaped like rings so that their electrostatic effect will exist in the center of them; the beam passes through this center."

"In other words the ring-shaped electrodes are electrostatic lenses?"

"Nope. It is the space between them. The lens is either convex or concave depending upon whether the voltage gradient is from positive to less positive or if it is positive to more positive, respectively. In an electrostatic lens for electrons, the thing is not like a glass lens for light. Whether your lens is diverging or converging depends upon which way your electron stream is running through it. With light, a convex lens will converge the light no matter which direction the light is coming from."

"Uh-huh. I see in a sort of vague manner. Now, fellows, go on from there. What's necessary to make this dingbat tick?"

"I want to think out loud," said Channing.

"That's nothing unusual," said Arden. "Can't we get into Joe's? You can't think without a tablecloth, either."

"What I'm thinking is this, Walt You've been trying to squirt electrons like a fireman runs a hose. Walt, how long do you suppose a sixteen-inch rifle would last if the explosives were constantly replaced and the fire burned constantly?"

"Not long," admitted Walt.

"A gun is an overloaded machine," said Don. "Even a little one. The life of a gun barrel is measured in seconds; totaling up the time of transit of all the rounds from new barrel to worn gun gives a figure expressed in seconds. Your electron gun, Walt, whether it be fish, flesh, or fowl, must be overloaded for an instant."

"Is overload a necessary requirement?" asked Arden. "It seems to me that you might be able to bore a sixteen-inch gun for a twenty-two. What now, little man?"

"By the time we get something big enough to do more than knock paint off, we'll have something bigger than a twenty-two," grinned Channing. "I was speaking in terms of available strength versus required punch. In the way that a girder will hold tremendous overloads for brief instants, a gun is extremely overloaded for milliseconds. We'll have a problem—"

"O. K., aside from that, have you figured out why I haven't been able to do more than warm anything larger than a house brick?"

"Sure," laughed Channing.

"What happens in a multigrid radio tube when the suppressor grid is hanging free?"

"Charges up and blocks the electron stream . . . hey! That's it!"

"What?" asked Arden.

"Sure," said Walt. "We fire off a batch of electrons, and the first contingent that arrives charges the affair so that the rest of the beam sort of wriggles out of line."

"Your meteor is going to take on a charge of phenomenal negative value, and the rest of your beam is going to be deflected away, just as your electron lenses deflect the original beam," said Channing. "And now another thing, old turnip. You're squirting out a lot of electrons. That's much amperage. Your voltage—velocity—is nothing to rave about. Watts is what you want, to corn a phrase."

"Phew," said Walt. "Corn, he says. Go on, prodigy, and make with the explanations. I agree, we should have more voltage and less quantity. But we're running the stuff at plenty of voltage now. Nothing short of a Van Der Graf generator would work—and while we've got one up on the forty-ninth level, we couldn't run a supply line down here without reaming a fifty-foot hole through the Station, and then I don't know how we'd get that kind of voltage down here without . . . that kind of stuff staggers the imagination. You can't juggle a hundred million volts on a wire. She'd squirt off in all directions."

"Another thing, whilst I hold it in my mind," said Channing thoughtfully. "You go flinging electrons off the Station in basketful after basketful, and the next bird that drops a ship on the landing stage is going to spot-weld himself right to the South end of Venus Equilateral. It wouldn't be long before the Station would find itself being pulled into Sol because of the electrostatic stress—if we didn't run out of electrons first!"

"I hardly think that we'd run out—but we might have a tough time flinging them away after a bit. Could be that we should blow out a fist full of positrons at the same time?"

"Might make up a concentric beam and wave the positive ions at the target," said Channing. "Might help."

"But this space-charge effect. How do we get around that?"

"Same way we make the electron gun work. Fire it off at a devilish voltage. Run your electron velocity up near the speed of light; the electrons at that speed will acquire considerable mass, in accordance with Lorenz's equation which shows that as the velocity of a mass reaches the speed of light, its mass becomes infinite. With a healthy mass built up by near-light velocities, the electrons will not be as easy to deflect. Then, too, we can do the damage we want before the charge can be built up that will deflect the stream. We ram 'em with a bundle of electrons moving so fast that the charging effect can not work; before the space charge can build up to the level required for self-nullification of our beam, the damage is done."

"And all we need is a couple of trillion volts. Two times ten to the twelfth power. *Grrr.*"

"I can see that you'll need a tablecloth," said Arden. "You birds can think better over at Joe's. Come along and feed the missus, Don."

Channing surveyed the instrument again, and then said: "Might as well, Walt. The inner man must be fed, and we can wrangle at the same time. Argument assists the digestion—and vice versa."

"Now," said Channing, as the dishes were pushed aside, clearing a space on the table. "What are we going to do?"

"That's what I've been worrying about," said Walt. "Let's list the things that make our gun ineffective."

"That's easy. It can't dish out enough. It's too dependent upon mobility. It's fundamentally inefficient because it runs out of ammunition too quick, by which I mean that it is a sort of gun with antiseptic bullets. It cures its own damage."

"Prevents," said Arden.

"All right, it acts as its own shield, electrostatically."

"About this mobility," said Walt, "I do not quite agree with that."

"You can't whirl a hunk of tube the size and weight of a good-sized telescope around fast enough to shoot holes in a racing spaceship," said Channing. "Especially one which is trying to dodge. We've got to rely upon something that can do the trick better. Your tube did all right following a meteor that runs in a course that can be predicted, because you can set up your meteor spotter to correct for the mechanical lag. But in a spaceship that is trying to duck your shot, you'll need something that works with the speed of light. And, since we're going to be forced into something heavy and hard-hitting, its inertia will be even more so."

"Heavy and hard-hitting means exactly what?"

"Cyclotron or betatron. One of those dingusses that whirls electrons around like a stone on a string until the string breaks and sends the stone out at a terrific speed. We need a velocity that sounds like a congressional figure."

"We've got a cyclotron."

"Yeah," drawled Channing. "A wheezy old heap that cries out in anguish every time the magnets are charged. I doubt that we could move the thing without it falling apart. The betatron is the ticket."

"But the cyclotron gives out with a lot more soup."

"If I had to increase the output of either one, I could do it a lot quicker with the betatron," said Channing. "In a cyclotron, the revolution of the electrons in their acceleration period is controlled by an oscillator, the voltage output of which is impressed on the D chambers. In order to speed up the electron stream, you'd have to do two things. One: Build a new oscillator that will dish out more power. Two: Increase the strength of the magnets.

"But in the betatron, the thing is run differently. The magnet is built for A. C. and the electron gun runs off the same. As your current starts up from zero, the electron gun squirts a bouquet of electrons into a chamber built like a pair of pie plates set rim to rim. The magnet's field begins to build up at the same time, and the resulting increase in field strength accelerates the electrons and at the same time, its increasing field keeps the little devils running in the same orbit. Shoot it with two-hundred-cycle current, and in the half cycle your electrons are made to run around the center a few million times. That builds up a terrific velocity—measured in six figures, believe it or not. Then the current begins to level off at the top of the sine wave, and the magnet loses its increasing phase. The electrons, still in acceleration, begin to whirl outward. The current levels off for sure and begins to slide down—and the electrons roll off at a tangent to their course. This stream can be collected and used. In fact, we have a two-hundred-cycle beam of electrons at a couple of billion volts. That, brother, ain't hay!"

"Is that enough?"

"Nope."

"Then how do you hope to increase this velocity? If it is easier to run this up than it would be the cyclotron, how do we go about it?"

Channing smiled and began to draw diagrams on the tablecloth. Joe looked over with a worried frown, and then shrugged his shoulders. Diagrams or not, this was an emergency—and besides, he thought, I need another lesson in high-powered gadgetry.

"The nice thing about this betatron," said Channing, "is the fact that it can and does run both ends on the same supply. The current and voltage phases are correct so that we do not require two supplies which operate in a carefully balanced condition. The cyclotron is one of the other kinds; though the one supply is strictly D. C., the strength of the field must be controlled separately from the supply to the oscillator that runs the D plates. You're sitting on a fence, juggling knobs and stuff all the time you are bombarding with a cyc.

"Now let us inspect the supply of the betatron. It is sinusoidal. There is the catch. There is the thing that makes it possible. That single fact makes it easy to step the power up to terrific quantities. Since the thing is fixed by nature so that the input is proportional—electron gun initial velocity versus magnetic field strength, if we increase the input voltage, the output voltage goes up without having to resort to manipulistic gymnastics on the part of the operator."

"Go on, Professor Maxwell."

"Don't make fun of a great man's name," said Arden. "If it wasn't for Clerk Maxwell, we'd still be yelling out of the window at one another instead of squirting radio beams all over the Solar System."

"Then make him quit calling me Tom Swift."

"Go on, Don, Walt and I will finish this argument after we finish Hellion Murdoch.

"May I?" asked Channing with a smile. He did not mind the interruption; he was used to it in the first place and he had been busy with his pencil in the second place. "Now look, Walt, what happens when you smack a charged condenser across an inductance?"

"You generate a damped cycle of the amplitude of the charge on the condenser, and of frequency equal to the L, C, constants of the condenser and inductance. The amplitude decays according to the factor Q, following the equation for decrement—"

"Never mind, I've got it here on my whiteboard," smiled Channing, pointing to the tablecloth. "You are right. And the purity of the wave?"

"Sinusoidal . . . hey! That's it!" Walt jumped to his feet and went to the telephone.

"What's 'it'?" asked Arden.

"The betatron we have runs off of a five-hundred-volt supply," chuckled Channing. "We can crank that up ten to one without running into any difficulty at all. Five-hundred-volt insulation is peanuts, and the stuff they put on wires nowadays is always good for ten times that just because it wouldn't be economical to try to thin the insulation down so that it only protects five hundred. I'll bet a hat that he would crank the input up to fifty thousand volts without too much sputtering—though I wouldn't know where to lay my lunch hooks on a fifty-thousand-volt condenser of any appreciable capacity. Well, stepping up the rig ten to one will dish us out just shy of a couple of thousand million volts, which, as brother Franks says, is not hay!"

Walt returned after a minute and said: "Warren's measuring the inductance of the betatron magnet. He'll calculate the value of C required to tune the thing to the right frequency and start to achieve that capacity by mazing up whatever high-voltage condensers we have on the Station. Now, Don, let's calculate how we're going to make the thing mobile."

"That's a horse of a different color. We'll have to use electromagnetic deflection. From the constants of the electron stream out of our souped-up Suzy, we'll have to compute the necessary field to deflect such a beam. That'll be terrific, because the electrons are hitting it up at a velocity approaching that of light—maybe a hundred and seventy thousand miles per—and their mass will be something fierce. That again will help to murder Murdoch; increasing mass will help to keep the electrons from being deflected, since it takes more to turn a heavy mass—et cetera, see Newton's laws of inertia for complete statement. Have 'em jerk the

D plates out of the cyc and bring the magnet frame down here—to the turret, I mean—and set 'em up on the vertical. We'll use that to run the beam up and down, we can't possibly get one hundred and eighty degree deflection, of course, but we can run the deflection over considerable range. It should be enough to catch a spaceship that is circling the Station. For the horizontal deflection, what have we got?"

"Nothing. But the cyc magnet is a double pole affair. We could break the frame at the D plates and set one winding sidewise to the other and use half on each direction."

"Sure. Have one of Warren's gang fit the busted pole pieces up with a return-magnetic frame so that the field will be complete. He can weld some girders on and around in an hour. That gives us complete deflection properties left and right; up and down. We should be able to cover a ninety-degree cone from your turret."

"That'll cover all of Murdoch's ships," said Walt.

"To bad we haven't got some U_{235} to use. I'd like to plate up one of his ships with some positive ions of U_{235} and then change the beam to slow neutrons. That might deter him from his life of crime."

"Variations, he wants," said Arden. "You're going to impale one ship on a beam of electrons, one ship on a beam of U_{235} ions; and what will you have on the third?"

"I'll think of something," said Channing. "A couple of pounds of U_{235} should make things hum, though."

"More like making them disappear," said Franks. "*Swoosh!* No ship. Just an incandescent mass falling into the Sun. I'm glad we haven't got U_{235} in any quantity out here. We catch a few slow neutrons now and then, and I wouldn't be able to sleep nights. The things just sort of wander right through the Station as though it weren't here at all; they stop just long enough to register on the counter upstairs and then they're gone."

"Well, to work, people. We've got a job to do in the next three and a half days."

Those days were filled with activity. Hauling the heavy parts down to the turret was no small job, but it was accomplished after a lot of hard work and quite a bit of tinkering with a cutting torch. The parts were installed in the outer skin, and the crew with the torch went back over their trail and replaced the gaping holes they left in the walls and floors of Venus Equilateral. The engineering department went to work, and for some hours the place was silent save for the clash of pencil on paper and the scratching of scalps. The most popular book in the Station became a volume on nuclear physics, and the second most popular book was a table of integrals. The stenographic force went to work combing the library for information pertaining to electronic velocities, and a junior engineer was placed in as buffer between the eager stenographers and the harried engineering department. This was necessary because the stenographers got to the point where they'd send anything at all that said either "electrons" or "velocity," and one of the engineers read halfway through a text on atomic structure before he realized that he had been sold a bill of goods. Wire went by the mile down to the turret, and men proceeded to blow out half of the meters in the Station with the high-powered beam. Luckily, the thing was completely nonspectacular, or Murdoch might have gained an inkling of their activities. The working crew manipulated constants and made haywire circuits, and finally announced that the beam would deflect—if the calculations were correct.

"They'd better be," said Channing. He was weary. His eyes were puffed from lack of sleep, and he hadn't had his clothing off in three days.

"They are," said Franks. He was in no better shape than Don.

"They'd better be right," said Channing ominously. "We're asking for a kick in the teeth. The first bundle of stuff that leaves our gun will energize Murdoch's meteor spotter by shear electrostatic force. His gun mounts, which you tell me are coupled to the meteor detector for aiming, will swivel to cover the turret out here. Then he'll let us have it right in the betatron. If we don't get him first, he'll get us second."

"Don," said Walt in a worried voice. "How are we going to replace the charge on the Station? Like the bird who was tossing baseballs out of the train—he quit when he ran out of them. Our gun will quit cold when we run out of electrons—or when the positive charge gets so high that the betatron can't overcome the electrostatic attraction."

"Venus Equilateral is a free grid," smiled Channing. "As soon as we shoot off electrons, Old Sol becomes a hot cathode and our Station collects 'em until the charge is equalized again."

"And what happens to the bird who is holding on to something when we make off with a billion volts? Does he scrape himself off the opposite wall in a week or so—after he comes to—or can we use him for freezing ice cubes? Seems to me that it might be a little bit fatal."

"Didn't think of that," said Channing. "There's one thing, their personal charge doesn't add up to a large quantity of electricity. If we insulate 'em and put 'em in their spacesuits, they'll be all right as long as they don't try to grab anything. They'll be on the up and down for a bit, but the resistance of the spacesuit is high enough to keep 'em from draining all their electrons out at once. I recall the experiments with early Van Der Graf generators at a few million volts—the operator used to sit in the charged sphere because it was one place where he couldn't be hit by man-made lightning. It'll be rough, but it won't kill us. Spacesuits, and have 'em sit in plastic chairs the feet of which are insulated from the floor by china dinner plates. This plastic wall covering that we have in the apartments is a blessing. If it were all bare steel, every room would be a miniature hell. Issue general instructions to that effect. We've been having emergency drills for a long time, now's the time to use the grand collection of elastomer spacesuits. Tell 'em we give 'em an hour to get ready."

Hellion Murdoch's voice came over the radio at exactly the second of the expiration of his limit. He called Channing and said:

"What is your answer, Dr. Channing?"

Don squinted down the pilot tube of the meteor spotter and saw the *Hippocrates* passing. It was gone before he spoke, but the second ship came along, and the pilot tube leaped into line with it. Don checked meters on the crude panel before him, and then pressed the plastic handle of a long lever.

There was the crash of a heavy-duty oil switch.

That was all.

Crackles of electricity flashed back and forth through the Station, and the smell of ozone arose. Electric light filaments leaned over crazily, trying to touch the inner walls of the glass. Panes of glass ran blue for an instant, and the nap of the carpets throughout the Station stood bolt upright. Hair stood on end, touched the plastic helmet dome, discharged, fell to the scalp, raised again and discharged, fell once more, and then repeated this raising and falling, again and again and again. Electric clocks ran crazily, and every bit of electronic equipment on the Station began to act in an unpredictable manner.

Then things settled down again as the solar emission charged the Station to equilibrium.

Aboard the ship, it was another story. The celestial globe of the meteor spotter blazed once in a blinding light and then went completely out of control. It danced with pin points of light, and the coupler that was used to direct the guns went crazy. Turrets tried to swivel, but the charge raised hob with the electronic controls, and the guns raised once and then fell, inert. One of them belched flame and fire, and the shell went wild. The carefully balanced potentials in the drive tubes was upset, and the ship lost headway. The heavy ion stream from the driving cathode bent and spread, touching the dynodes in the tube. The resulting current brought them to a red heat, and they melted down and floated through the evacuated tube in round droplets. Instruments went wild, and gave every possible answer, and the ship became a bedlam of ringing bells and flashing danger lights.

But the crew was in no shape to appreciate the display. From metal parts in the ship there appeared coronas that reached for the unprotected men, and seared their flesh. And since their gravity-apparent was gone, they floated freely through the air, and came in contact with highly charged walls, ceiling, and floor; to say nothing of the standard metal furniture.

It was a sorry bunch of pirates that found themselves in a ship-without-motive-power that was beginning to leave their circular course on a tangent that would let them drop into the Sun.

"That's my answer, Murdoch!" snapped Channing. "Watch your second ship!"

"You young devil," shouted Murdoch, "what did you do?"

"You never thought that it would be an electronics engineer that made the first energy gun, did you, Murdoch? I'm now going to take a shot at No. 3!"

No. 3's turrets swiveled around and from the guns flashes of fire came streaming. Channing punched his lever savegely, and once again the Station was tortured by the effects of its own offensive.

Ship No. 3 suffered the same fate as No. 2.

Then, seconds later, armor-piercing shells began to hit Venus Equilateral. They hit, and because of the terrific charge, they began to arc at the noses. The terrible current passed through the fuses, and the shells exploded on contact instead of boring inside before detonation. Metal was bent and burned, but only a few tiny holes resulted. As the charge on the Station approached equilibrium once more, men ran with torches to seal these holes.

"Murdoch," said Channing, "I want you!"

"Come and get me."

"Land—or die!" snapped Channing in a vicious tone. "I'm no humanitarian, Murdoch. You'd be better off dead!"

"Never," said Hellion Murdoch.

Channing punched the lever for the third time, but as he did, Murdoch's ship leaped forward under several G. The magnets could not change in field soon enough to compensate for this change in direction, and the charge failed to connect as a bull's-eye. It did expend some of its energy on the tail of the ship. Not enough to cripple the vessel, but the *Hippocrates* took on a charge of enough value to make things hard on the crew.

Metal sparked, and instruments went mad. Meters wound their needles against the end pegs. The celestial globe glinted in a riot of color and then went completely dead. Gun servers dropped their projectiles as they became too heavily charged to handle, and they rolled across the turret floors, creating panic in the gun crews. The pilot fought the controls, but the charge on his driver tubes was sufficient to make his helm completely unpredictable. The panel sparked at him and seared his hands, spoiling his nervous control and making him heavy-handed.

"Murdoch," cried Channing in a

hearty voice, "that was a miss! Want a hit?"

Murdoch's radio was completely dead. His ship was yawing from side to side as the static charges raced through the driver tubes. The pilot gained control after a fashion, and decided that he had taken enough. He circled the Station warily and began to make a shaky landing at the South end.

Channing saw him coming, and with a glint in his eye, he pressed the lever for the fourth and last time.

Murdoch's ship touched the landing stage just after the charge had been driven out into space. The heavy negative charge on the *Hippocrates* met the heavy positive charge on Venus Equilateral. The ship touched, and from that contact, there arose a cloud of incandescent gas. The entire charge left the ship at once, and through that single contact. When the cloud dissipated, the contact was a crude but efficient welded joint that was gleaming white-hot.

Channing said to Walt: "That's going to be messy."

"Inside of the *Hippocrates,* men were still frozen to their handholds. It was messy, and cleaning up the *Hippocrates* was a job not relished by those who did it.

But cleaning up Venus Equilateral was no small matter either.

Weeks went by before the snarled-up instruments were repaired. Weeks in which the captured *Hippocrates* was repaired, too, and used to transport material and special supplies from Terra, and Venus, and Mars. Weeks in which the service from planet to planet was interrupted and erratic.

Then one day, service was restored, and life settled down to a reasonable level. It was after this time that Walt and Channing found time to spend an idle hour together. Walt raised his glass and said: "Here's to electrons!"

"Yeah," grinned Channing. "Here's to electrons. Y'know, Walt, I was a little afraid that space might become a sort of wild West show, with the ships bristling with space guns and betatrons and stuff like that. In which case you'd have been a stinking benefactor. But if the recoil is as bad as the output—and Newton said that it must be—I can't see ships cluttering up their insides with stuff that'll screw up their instruments and driver tubes. But the thing that amuses me about the whole thing is the total failure you produced."

"Failure?" asked Walt. "What failed?"

"Don't you know? Have you forgotten? Do you realize that spaceships are still ducking around meteors instead of blasting them out of the way with the Franks Electron Gun? Or did you lose sight of the fact that this dingbat started out in life as a meteor-sweeper?"

Walt glared over the rim of his glass, but he had nothing to say.

THE END

Death Sentence

by Isaac Asimov

Illustrated by Fax

***OUR** psychologists of today have set up colonies of monkeys and other animals as experiments. On a larger scale, with larger means, a greater experiment could be undertaken—*

Brand Gorla smiled uncomfortably, "These things exaggerate, you know."

"No, no, no!" The little man's albino-pink eyes snapped. "Dorlis was great when no human had ever entered the Vegan System. It was the capital of a Galactic Confederation greater than ours."

"Well, then, let's say that it was an ancient capital. I'll admit that and leave the rest to an archaeologist."

"Archaeologists are no use. What I've discovered needs a specialist in its own field. And you're on the Board."

Brand Gorla looked doubtful. He remembered Theor Realo in senior year—a little white misfit of a human who skulked somewhere in the background of his reminiscences.

It had been a long time ago, but the albino had been queer. *That* was easy to remember. And he was still queer.

"I'll try to help," Brand said, "if you'll tell me what you want."

Theor watched intently, "I want you to place certain facts before the Board. Will you promise that?"

Brand hedged, "Even if I help you along, Theor, I'll have to remind you that I'm junior member of the Psychological Board. I haven't much influence."

"You must do your best. The facts will speak for themselves." The albino's hands were trembling.

"Go ahead." Brand resigned himself. The man was an old school fellow. You couldn't be *too* arbitrary about things.

Brand Gorla leaned back and relaxed. The light of Arcturus shone through the ceiling-high windows, diffused and mellowed by the polarizing glass. Even this diluted version of sunlight was too much for the pink eyes of the other, and he shaded his eyes as he spoke.

"I've lived on Dorlins twenty-five years, Brand," he said, "I've poked into places no one today knew existed, and I've found things. Dorlis was the scientific and cultural capital of a civilization greater than ours. Yes it was, and particularly in psychology."

"Things in the past always seem greater." Brand condescended a smile. "There is a theorem to that effect which you'll find in any elementary text. Freshmen invariably call it the "GOD Theorem." Stands for 'Good-Old-Days,' you know. But go on."

Theor frowned at the digression. He hid the beginning of a sneer, "You can always dismiss an uncomfortable fact by pinning a dowdy label to it. But tell me this. What do you know of Psychological Engineering?"

Brand shrugged, "No such thing. Anyway, not in the strict mathematical sense. All propaganda and advertising is a crude form of hit-and-miss Psych Engineering—and pretty effective sometimes. Maybe that's what you mean."

"Not at all. I mean actual experimentation, with masses of people, under controlled conditions, and over a period of years."

"Such things have been discussed. It's not feasible in practice. Our social structure couldn't stand much of it, and we don't know enough to set up effective controls."

Theor suppressed excitement, "But the ancients *did* know enough. And they *did* set up controls."

Brand considered phlegmatically, "Startling and interesting, but how do you know?"

"Because I found the documents relating to it." He paused breathlessly. "An entire planet, Brand. A complete world picked to suit, peopled with beings under strict control from every angle. Studied, and charted, and experimented upon. Don't you get the picture?"

Brand noted none of the usual stigmata of mental uncontrol. A closer investigation, perhaps—

He said evenly, "You must have

been misled. It's thoroughly impossible. You can't control humans like that. Too many variables."

"And that's the point, Brand. They weren't humans."

"What?"

"They were robots, positronic robots. A whole world of them, Brand, with nothing to do but live and react and be observed by a set of psychologists that were *real* psychologists."

"That's mad!"

"I have proof—because that robot world still exists. The First Confederation went to pieces, but that robot world kept on going. It still exists."

"And how do you know?"

Theor Realo stood up, "Because I've been there these last five years!"

The Board Master threw his formal red-edged gown aside and reached into a pocket for a long, gnarled and decidedly unofficial cigar.

"Preposterous," he grunted, "and thoroughly insane."

"Exactly," said Brand, "and I can't spring it on the Board just like that. They wouldn't listen. I've got to get this across to you first, and then, if you can put your authority behind it—"

"Oh, nuts! I never heard anything as— Who is the fellow?"

Brand sighed, "A crank, I'll admit that. He was in my class at Arcturus U. and a crack-pot albino even then. Maladjusted as the devil, hipped on ancient history, and just the kind that gets an idea and goes through with it by plain, dumb plugging. He's poked about in Dorlis for twenty-five years, he says. He's got the complete records of practically an entire civilization."

The Board Master puffed furiously. "Yeah, I know. In the telestat serials, the brilliant amateur always uncovers the great things. The free lance. The lone wolf. Nuts! Have you consulted the Department of Archaeology?"

"Certainly. And the result was interesting. No one bothers with Dorlis. This isn't just ancient history, you see. It's a matter of fifteen thousand years. It's practically myth. Reputable archaeologists don't waste too much time with it. It's just the thing a book-struck layman with a single-track mind *would* uncover. After this, of course, if the business turns out right, Dorlis will become an archaeologist's paradise."

The Board Master screwed his homely face into an appalling grimace. "It's very unflattering to the ego. If there's any truth in all this, the so-called First Confederation must have had a grasp of psychology so far past ours, as to make us out to be blithering imbeciles. Too, they'd have to build positronic robots that would be about seventy-five orders of magnitude above anything we've even blueprinted. Galaxy! Think of the mathematics involved."

"Look, sir, I've consulted just about everybody. I wouldn't bring this thing to you if I weren't certain that I had every angle checked. I went to Blak just about the first thing, and he's consultant mathematician to United Robots. He says there's no limit to these things. Given the time, the money, and the *advance in psychology*—get that—robots like that could be built right now."

"What proof has he?"

"Who, Blak?"

"No, no! Your friend. The albino. You said he had papers."

"He has. I've got them here. He's got documents—and there's no denying their antiquity. I've had that checked every way from Sunday. I can't read them, of course. I don't know if anyone can, except Theor Realo."

"That's stacking the deck, isn't it? We have to take his say-so."

"Yes, in a way. But he doesn't claim to be able to decipher more than portions. He says it is related to ancient Centaurian, and I've put linguists to work on it. It can be cracked and if his translation isn't accurate, we'll know about it."

"All right. Let's see it."

Brand Gorla brought out the plastic-mounted documents. The Board Master tossed them aside and reached for the translation. Smoke billowed as he read.

"Humph," was his comment. "Further details are on Dorlis, I suppose."

"Theor claims that there are some hundred to two hundred tons of blueprints altogether, on the brain plan of the positronic robots alone. They're still there in the original vault. But that's the least of it. He's been on the robot world itself. He's got photocasts, teletype recordings, all sorts of details. They're not integrated, and obviously the work of a layman who knows next to nothing about psychology. Even so, he's managed to get enough data to prove pretty conclusively that the world he was on wasn't . . . uh . . . natural."

"You've got that with you, too."

"All of it. Most of it's on microfilm, but I've brought the projector. Here are your eyepieces."

An hour later, the Board Master said, "I'll call a Board Meeting tomorrow and push this through."

Brand Gorla grinned tightly, "We'll send a commission to Dorlis?"

"When," said the Board Master dryly, "and if we can get an appropriation out of the University for such an affair. Leave this material with me for the while, please. I want to study it a little more."

Theoretically, the Governmental Department of Science and Technology exercises administrative control over all scientific investigation. Actually, however, the pure research groups of the large universities are thoroughly autonomous bodies, and, as a general rule, the Government does not care to dispute that. But a general rule is not necessarily a universal rule.

And so, although the Board Master scowled and fumed and swore, there was no way of refusing Wynne Murry an interview. To give Murry his complete title, he was under secretary in charge of psychology, psycopathy and mental technology. And he was a pretty fair psychologist in his own right.

So the Board Master might glare, but that was all.

Secretary Murry ignored the glare cheerfully. He rubbed his long chin against the grain and said, "It amounts to a case of insufficient information. Shall we put it that way?"

The Board Master said frigidly, "I don't see what information you want. The government's say in university appropriations is purely advisory, and in this case, I might say, the advice is unwelcome.

Murry shrugged, "I have no quarrel with the appropriation. But you're not going to leave the planet without government permit. That's where the insufficient information comes in."

"There is no information other than we've given you."

"But things have leaked out. All this is childish and rather unnecessary secrecy."

The old psychologist flushed. "Secrecy! If you don't know the academic way of life, I can't help you. Investigations, especially those of major importance, aren't, and can't be, made public, until definite progress has been made. When we get back, we'll send you copies of whatever papers we publish."

Murry shook his head, "Uh-uh. Not enough. You're going to Dorlis, aren't you?"

"We've informed the Department of Science of that."

"Why?"

"Why do you want to know?"

"Because it's big, or the Board Master wouldn't go himself. What's this about an older civilization and a world of robots?"

"Well, then, you know."

"Only vague notions, we've been able to scrabble up. I want the details."

"There are none that we know now. We won't know until we're on Dorlis."

"Then I'm going with you."

"What!"

"You see, I want the details, too."

"Why?"

"Ah," Murry unfolded his legs and stood up, "now *you're* asking the questions. It's no use, now. I know that the universities aren't keen on government supervision, and I know that I can expect no willing help from *any* academic source. But, by Arcturus, I'm going to get help this time, and I don't care how you fight it. Your expedition is going nowheres, unless I go with you—representing the government."

Dorlis, as a world, is not impressive. Its importance to Galactic economy is nil, its position far off the great trade routes, its natives backward and unenlighted, its history obscure. And yet somewhere in the heaps of rubble that clutter an ancient world, there is obscure evidence of an influx of flame and destruction that destroyed the Dorlis of an earlier day—the greater capital of a greater Federation.

And somewhere in that rubble, men of a newer world poked and probed and tried to understand.

The Board Master shook his head and then pushed back his grizzling hair. He hadn't shaved in a week.

"The trouble is," he said, "that we have no point of reference. The language can be broken, I suppose, but nothing can be done with the notation."

"I think a great deal has been done."

"Stabs in the dark! Guessing games based on the translations of your albino friend. I won't base any hopes on that."

Brand said, "Nuts! You spent two years on the Nimian Anomaly, and so far only two months on this, which happens to be a hundred thousand times the job. It's something else that's getting you." He smiled grimly. "It doesn't take a psychologist to see that the government man is in your hair."

The Board Master bit the end off a cigar and spat it four feet. He said slowly, "There are three things about that mule-headed idiot that make me sore. First, I don't like government interference. Second, I don't like a stranger sniffing about when we're on top of the biggest thing in the history of psychology. Third, what in the Galaxy does he want? *What is he after?*"

"I don't know."

"What *should* he be after? Have you thought of it at all?"

"No. Frankly, I don't care. I'd ignore him if I were you."

"You would," said the Board Master violently. "You would! You think the government's entrance into this affair need only be ignored. I suppose you know that this Murry calls himself a psychologist?"

"I know that."

"And I suppose you know he's been displaying a devouring interest in all that we've been doing."

"That, I should say, would be natural."

"Oh! And you know further—" His voice dropped with startling suddenness. "All right, Murry's at the door. Take it easy."

Wynne Murry grinned a greeting, but the Board Master nodded unsmilingly.

"Well, sir," said Murry bluffly, "do you know I've been on my feet for forty-eight hours? You've *got* something here. Something big."

"Thank you."

"No, no. I'm serious. The robot world exists."

"Did you think it didn't?"

The secretary shrugged amiably. "One has a certain natural skepticism. What are your future plans?"

"Why do you ask?" The Board Master grunted his words as if they were being squeezed out singly.

"To see if they jibe with my own."

"And what are your own?"

The secretary smiled. "No, no. You take precedence. How long do you intend staying here?"

"As long as it takes to make a

fair beginning on the documents involved."

"That's no answer. What do you mean by a fair beginning."

"I haven't the slightest idea. It might take years."

"Oh, damnation."

The Board Master raised his eyebrows and said nothing.

The secretary looked at his nails. "I take it you know the location of this robot world."

"Naturally. Theor Realo was there. His information up to now has proven very accurate."

"That's right. The albino. Well, why not go there?"

"Go there! Impossible?"

"May I ask why?"

"Look," said the Board Master with restrained impatience, "you're not here by our invitation, and we're not asking you to dictate our course of actions, but just to show you that I'm not looking for a fight, I'll give you a little metaphorical treatment of our case. Suppose we were presented with a huge and complicated machine, composed of principles and materials of which we knew next to nothing. It is so vast we can't even make out the relationship of the parts, let alone the purpose of the whole. Now, would you advise me to begin attacking the delicate mysterious moving parts of the machine with a detonating ray before I know what it's all abcut?"

"I see your point, of course, but you're becoming a mystic. The metaphor is farfetched."

"Not at all. These positronic robots were constructed along lines we know nothing of as yet and were intended to follow lines with which we are entirely unacquainted. About the only thing we know is that the robots were put aside in complete isolation, to work out their destiny by themselves. To ruin that isolation would be to ruin the experiment. If we go there in a body, introducing new unforeseen factors, inducing unintended reactions, everything is ruined. The littlest disturbance—"

"Poppycock! Theor Realo has already gone there."

The Board Master lost his temper suddenly. "Don't you suppose I know that? Do you suppose it would ever have happened if that cursed albino hadn't been an ignorant fanatic without any knowledge of psychology at all? Galaxy knows what the idiot has done in the way of damage."

There was a silence. The secretary clicked his teeth with a thoughtful fingernail. "I don't know . . . I don't know. But I've got to find out. And I can't wait years."

He left, and the Board Master turned seethingly to Brand, "And now what's he getting at? And how are we going to stop him from going to the robot world if he wants to?"

"I don't see how he can go if we don't let him. *He* doesn't head the expedition."

"Oh, doesn't he? *That's* what I was about to tell you just before he came in. Ten ships of the fleet have landed on Dorlis since we arrived."

"What!"

"Just that."

"But what for?"

"That, my boy, is what I don't understand, either."

"Mind if I drop in?" said Wynne Murry, pleasantly, and Theor Realo looked up in sudden anxiety from the papers that lay in hopeless disarray on the desk before him.

"Come in. I'll clear off a seat for you." The albino hustled the mess off one of the two chairs in a state of twittering nerves.

Murry sat down and swung one long leg over the other. "Are you assigned a job here, too." He nodded at the desk.

Theor shook his head and smiled feebly. Almost automatically, he brushed the papers together in a heap and turned them face down.

In the months since he had returned to Dorlis with a hundred psychologists of various degrees of renown, he had felt himself pushed farther and farther from the center of things. There was room for him no longer. Except to answer questions on the actual state of things upon the robot world, which he alone had visited, he played no part. And even there, he detected, or seemed to detect, anger that *he* should have gone, and not a competent scientist.

It was a thing to be resented. Yet, somehow, it had always been like that.

"Pardon me." He had let Murry's next remark slip.

The secretary repeated, "I say it's surprising you're *not* put to work then. You made the original discovery, didn't you?"

"Yes," the albino brightened. "But it went out of my hands. It got beyond me."

"You were on the robot world, though."

"That was a mistake, they tell me. I might have ruined everything."

Murry grimaced. "What really gets them, I guess, is that you've got a lot of first-hand dope that they didn't. Don't let their fancy titles fool you into thinking you're a nobody. A layman with common sense is better than a blind specialist. You and I—I'm a layman, too, you know—have to stand up for our rights. Here, have a cigarette."

"I don't sm— I'll take one, thank you." The albino felt himself warming to the long-bodied man opposite. He turned the papers face upward again, and lit up, bravely but uncertainly.

"And you *were* on this robot world, that is the main point."

"Five years." Theor spoke carefully, skirting around urgent coughs.

"Would you answer a few questions about the world?"

"I suppose so. That's all they ever ask me about. But hadn't you better ask *them?* They've probably got it all worked out now." He blew the smoke as far from himself as possible.

Murry said, "Frankly, they haven't even begun and I want the

information without benefit of confusing psychological translation. First of all, what kind of people—or things—are these robots? You haven't a photocast of one of them, have you?"

"Well, no. I didn't like to take 'casts of them. But they're not things. They're *people!*"

"No? Do they look like—people?"

"Yes—mostly. Outside, anyway. I brought some microscopic studies of the cellular structure that I got hold of. The Board Master has them. They're different inside, you know, greatly simplified. But you'd never know that. They're interesting—and nice."

"Are they simpler than the other life of the planet?"

"Oh, no. It's a very primitive planet. And . . . and," he was interrupted by a spasm of coughing and crushed the cigarette to death as unobtrusively as possible. "They've got a protoplasmic base, you know. I don't think they have the slightest idea they're robots."

"No. I don't suppose they would have. What about their science?"

"I don't know. I never got a chance to see. And everything was so different. I guess it would take an expert to understand."

"Did they have machines?"

The albino looked surprised. "Well, of course. A good many, of all sorts."

"Large cities?"

"Yes!"

The secretary's eyes grew thoughtful. "And you like them. Why?"

Theor Realo was brought up sharply. "I don't know. They were just likable. We got along. They didn't bother me so. It's nothing I can put my finger on. Maybe it's because I have it so hard getting along back home, and they weren't as difficult as real people."

"They were more friendly?"

"N-no. Can't say so. They never quite accepted me. I was a stranger, didn't know their language at first—all that. But"—he looked up with sudden brightness—"I understood them better. I could tell what they were thinking better. I— But I don't know why."

"Hm-m-m. Well—another cigarette? No? I've got to be walloping the pillow now. It's getting late. How about a twosome at golf tomorrow? I've worked up a little course. It'll do. Come on out. The exercise will put hair on your chest."

He grinned and left.

He mumbled one sentence to himself: "It looks like a death sentence"—and whistled thoughtfully as he passed along to his own quarters.

He repeated the phrase to himself when he faced the Board Master the next day, with the sash of office about his waist. He did not sit down.

"Again?" said the Board Master, wearily.

"Again!" assented the secretary. "But real business this time. I may have to take over direction of your expedition."

"What! Impossible, sir! I will listen to no such proposition."

"I have my authority." Wynne Murry presented the metalloid cylinder that snapped open at a flick of the thumb. "I have full powers and full discretion as to their use. It is signed, as you will observe, by the chairman of the Congress of the Federation."

"So— But why?" The Board Master, by an effort, breathed normally. "Short of arbitrary tyranny, is there a reason?"

"A very good one, sir. All along we have viewed this expedition from different angles. The Department of Science and Technology views the robot world not from the point of view of a scientific curiosity, but from the standpoint of its interference with the peace of the Federation. I don't think you've ever stopped to consider the danger inherent in this robot world."

"None that I can see. It is thoroughly isolated and thoroughly harmless."

"How can you know?"

"From the very nature of the experiment," shouted the Board Master angrily. "The original planners wanted as nearly a completely closed system as possible. Here they are, just as far off the trade routes as possible, in a thinly populated region of space. The whole idea was to have the robots develop free of interference."

Murry smiled. "I disagree with you there. Look, the whole trouble with you is that you're a theoretical man. You look at things the way they ought to be and I, a practical man, look at things as they are. No experiment can be set up and allowed to run indefinitely under its own power. It is taken for granted that somewhere there is at least an observer who watches and *modifies* as circumstances warrant."

"Well?" said the Board Master stolidly.

"Well, the observers in this experiment, the original psychologists of Dorlis, passed away with the First Confederation, and for fifteen thousand years the experiment has proceeded by itself. Little errors have added up and become big ones and introduced alien factors which induced still other errors. It's a geometric progressions. And there's been no one to halt it."

"Pure hypothesis."

"Maybe. But you're interested only in the robot world, and I've got to think of the entire Federation."

"And just what possible danger can the robot world be to the Federation? I don't know *what* in Arcturus you're driving at, man."

Murry sighed. "I'll be simple, but don't blame me if I sound melodramatic. The Federation hasn't had any internal warfare for centuries. What will happen if we come into contact with these robots?"

"Are you afraid of one world?"

"Could be. What about their science? Robots can do funny things sometimes."

"What science can they have? They're not metal-electricity supermen. They're weak protoplasmic creatures, a poor imitation of actual humanity, built around a positronic brain adjusted to a set of simplified human psychological laws. If the word 'robot' is scaring you—"

"No, it isn't, but I've talked to Theor Realo. He's the only one who's seen them, you know."

The Board Master cursed silently and fluently. It came of letting a weak-minded freak of a layman get underfoot where he could babble and do harm.

He said, "We've got Realo's full story, and we've evaluated it fully and capably. I assure you no harm exists in them. The experiment is so thoroughly academic, I wouldn't spend two days on it, if it weren't for the broad scope of the thing. From what we see, the whole idea was to build up a positronic brain containing modifications of one or two of the fundamental axioms. We haven't worked out the details, but they must be minor, as it was the first experiment of this nature ever tried, and even the great mythical psychologists of that day had to progress stepwise. Those robots, I tell you, are neither supermen nor beasts. I assure you—as a psychologist."

"Sorry! I'm a psychologist, too. A little more rule-of-thumb, I'm afraid. That's all. But even little modifications! Take the general spirit of combativeness. That isn't the scientific term, but I've no patience for that. You know what I mean. We humans used to be combative. But it's being bred out of us. A stable political and economic system doesn't encourage the waste energy of combat. It's not a survival factor. But suppose the robots are combative. Suppose as the result of a wrong turn during the millennia they've been unwatched, they've become far more combative than ever their first makers intended. They'd be uncomfortable things to be with."

"And suppose all the stars in the Galaxy became novae at the same time. Let's *really* start worrying."

"And there's another point." Murry ignored the other's heavy sarcasm. "Theor Realo liked those robots. He liked robots better than he likes real people. He felt that he fitted there, and we all know he's been a bad misfit in his own world."

"And what," asked the Board Master, "is the significance of that?"

"You don't see it?" Wynne Murry lifted his eyesbrows. "Theor Realo likes those robots because he is *like* them, obviously. I'll guarantee right now that a complete psychic analysis of Theor Realo will show a modification of several fundamental axioms, and the same ones as in the robots.

"And," the secretary drove on without a pause, "Theor Realo worked for a quarter of a century to prove a point, when all science would have laughed him to death if they had known about it. There's fanaticism there; good, honest, *in-*

human perseverance. *Those robots are probably like that!*"

"You're advancing no logic. You're arguing like a maniac, like a moon-struck idiot."

"I don't need strict mathematical proof. Reasonable doubt is sufficient. I've got to protect the Federation. Look, it *is* reasonable, you know. The psychologists of Dorlis weren't as super as all that. They have to advance stepwise, as you yourself pointed out. Their humanoids—let's not call them robots—were only imitations of human beings and they couldn't be good ones. Humans possess certain very, *very* complicated reaction systems—things like social consciousness, and a tendency toward the establishment of ethical systems; and more ordinary things like chivalry, generosity, fair play and so on, that simply can't possibly be duplicated. I don't think those humanoids can have them. But they *must* have perseverance, which practically implies stubbornness and combativeness, if my notion on Theor Realo holds good. Well, if their science is anywheres at all, then I don't want to have them running loose in the Galaxy, if our numbers are a thousand or million times theirs. And I don't intend to permit them to do so!"

The Board Master's face was rigid. "What are your immediate intentions?"

"As yet undecided. But I think I am going to organize a small-scale landing on the planet."

"Now wait." The old psychologist was up and around the desk. He seized the secretary's elbow. "Are you quite certain you know what you're doing? The potentialities in this massive experiment are beyond any possible precalculation by you or me. You can't know what you're destroying."

"I know. Do you think I enjoy what I'm doing? This isn't a hero's job. I'm enough of a psychologist to want to know what's going on, but I've been sent here to protect the Federation and to the best of my ability I intend doing it—and a dirty job it is. But I can't help it."

"You can't have thought it out. What can you know of the insight it will give us into the basic ideas of psychology? This will amount to a fusion of two Galactic systems, that will send us to heights that will make up in knowledge and power a million times the amount of harm the robots could ever do, if they *were* metal-electricity supermen."

The secretary shrugged. "Now you're the one that is playing with faint possibilities."

"Listen, I'll make a deal. Blockade them. Isolate them with your ships. Mount guards. But don't touch them. Give us more time. Give us a chance. You must!"

"I've thought of that. But I would have to get Congress to agree to that. It would be expensive, you know."

The Board Master flung himself into his chair in wild impatience. "What kind of expense are you talking about? Do you realize the nature of the repayment if we succeed?

Murry considered; then, with a half smile, "What if they develop interstellar travel?"

The Board Master said quickly, "Then I'll withdraw my objections."

The secretary rose, "I'll have it out with Congress."

Brand Gorla's face was carefully emotionless, as he watched the Board Master's stooped back. The cheerful pet talks to the available members of the expedition lacked meat, and he listened to them impatiently.

He said, "What are we going to do now?"

The Board Master's shoulders twitched and he didn't turn. "I've sent for Theor Realo. That little fool left for the Eastern Continent last week—"

"Why?"

The older man blazed at the interruption. "How can I understand anything that freak does. Don't you see that Murry's right? He's a psychic abnormality. We had no business leaving him unwatched. If I had ever thought of looking at him twice, I wouldn't have. He's coming back now, though, and he's going to stay back." His voice fell to a mumble. "Should have been back two hours ago."

"It's an impossible position, sir," said Brand, flatly.

"Think so?"

"Well— Do *you* think Congress will stand for an indefinite patrol off the robot world? It runs into money and average Galactic citizens aren't going to see it as worth the taxes. The psychological equations degenerate into the axioms of common sense. In fact, I don't see why Murry agreed to consult Congress."

"Don't you?" The Board Master finally faced his junior. "Well, the fool considers himself a psychologist, Galaxy help us, and that's his weak point. He flatters himself that he doesn't want to destroy the robot world in his heart, but that it's the good of the Federation that requires it. And he'll jump at any reasonable compromise. Congress won't agree to it indifinitely, you don't have to point that out to me." He was talking quietly, patiently. "But I will ask for ten years, two years, six months—as much as I can get. I'll get something. In that time, we'll learn new facts about the world. Somehow we'll strengthen our case and renew the agreement when it expires. We'll save the project yet."

There was a short silence and the Board Master added slowly and bitterly, "And that's where Theor Realo plays a vital part."

Brand Gorla watched silently, and waited. The Board Master said, "On that one point Murry saw what we didn't. Realo is a psychological cripple, and is our real clue to the whole affair. If we study him, we'll have a rough picture of what the robot is like, distorted of course, since his environment has been a hostile, unfriendly one. But we can make allowance for that, estimate his nature in a— Ahh, I'm tired of the whole subject."

The signal box flashed, and the Board Master sighed. "Well, he's here. All right, Gorla, sit down, you make me nervous. Let's take a look at him."

Theor Realo came through the door like a comet and brought himself to a panting halt in the middle of the floor. He looked from one to the other with weak, peering eyes.

"How did all this happen?"

"All what?" said the Board Master coldly. "Sit down. I want to ask you some questions."

"No. You first answer *me*."

"Sit down!"

Realo sat. His eyes were brimming. "They're going to destroy the robot world."

"Don't worry about that."

"But you said they could if the robots discovered interstellar travel. You said so. You fool. Don't you see—" He was choking.

The Board Master frowned uneasily. "Will you calm down and talk sense?"

The albino gritted his teeth and forced the words out. "But they'll *have* interstellar travel before long."

And the two psychologists shot toward the little man.

"What!!"

"Well . . . well, what do you think?" Realo sprang upward with all the fury of desperation. "Did you think I landed in a desert or in the middle of an ocean and explored a world all by myself? Do you think life is a storybook? I was captured as soon as I landed and taken to a big city. At least, I think it was a big city. It was different from our kind. It had— But I won't tell you."

"Never mind the city," shrieked the Board Master. "You were captured. Go ahead."

"They studied *me*. They studied my machine. And then, one night, I left, to tell the Federation. They didn't know I left. They didn't want me to leave." His voice broke. "And I would have stayed as soon as not, but the Federation had to know."

"Did you tell them anything about your ship?"

"How could I? I'm no mechanic. I don't know the theory or construction. But I showed them how to work the controls and let them look at the motors. That's all."

Brand Gorla said, to himself mostly, "Then they'll never get it. That isn't enough."

The albino's voice raised itself in sudden shrieking triumph. "Oh, yes, they will. I know them. They're machines, you know. They'll work on that problem. And they'll work. And they'll work. And they'll never quit. And they'll get it. They got enough out of me. I'll *bet* they got enough."

The Board Master looked long, and turned away—wearily. "Why didn't you tell us?"

"Because you took my world away from me. I discovered it—by myself—all by myself. And after I had done all the real work, and invited you in, you threw me out.

All you had for me was complaints that I had landed on the world and might have ruined everything by interference. Why should I tell you? Find out for yourselves if you're so wise, that you could afford to kick me around."

The Board Master thought bitterly, "Misfit! Inferiority complex! Persecution mania! Nice! It all fits in now that we've bothered to take our eyes off the horizon and see what was under our nose. And now it's all ruined."

He said, "All right, Realo, we all lose. Go away."

Brand Gorla said tightly, "All over? Really all over?"

The Board Master answered, "Really all over. The original experiment as such is over. The distortions created by Realo's visit will easily be large enough to make the plans we are studying here a dead language. And besides—Murry is right. If they have interstellar travel, they're dangerous."

Realo was shouting, "But you're not going to destroy them. You can't destroy them. They haven't hurt anyone."

There was no answer, and he raved on, "I'm going back. I'll warn them. They'll be prepared. I'll warn them."

He was backing toward the door, his thin white hair bristling, his red-rimmed eyes bulging.

The Board Master did not move to stop him when he dashed out.

"Let him go. It was *his* lifetime. I don't care any more."

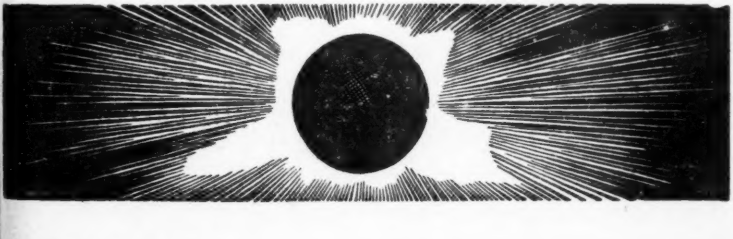
Theor Realo smashed toward the robot world at an acceleration that was half choking him.

Somewhere ahead was the dust-speck of an isolated world with artificial imitations of humanity, struggling along in an experiment that had died. Struggling blindly toward a new goal of interstellar travel that was to be their death sentence.

He was heading toward that world, toward the same city in which he had been "studied" the first time. He remembered it well. Its name was the first words of their language he had learned.

New York!

THE END.



The Beast

by A. B. van Vogt

Illustrated by Orban

***Given** time, even a fumble-witted Neanderthal could learn to be a sly and deadly opponent. And The Beast had had time—and was master over a long-forgotten power—*

Pendrake passed under the corner archway of the drugstore, emerged onto Fiftieth Street—and stopped short.

The twin aërogel towers across the street looked strangely bare and different. Pendrake stared blankly for a moment before he saw what was wrong: The plasto-glitter sign was gone, the sign that had read:

CYRUS LAMBTON
LAND SETTLEMENT PROJECT

Slightly more than two years had passed since that day in August, 1948, when he had found an atomic engine in the hillside near Crescentville, slightly less than two years since he had traced the marvelous machine to these turreted towers and to a group of scientists who were secretly operating spaceships to Venus, carrying emigrants to that fantastically lovely and fertile planet under an idealistic plan of their own.

Three times he had been to Venus himself after Eleanor and he resumed their badly shattered married life. But now for nearly a year Eleanor had required constant attention.

The baby was born dead. Eleanor in her intense fashion was still taking it hard; and the doctor advised a change of scene. What better place than Venus: so here he was to make the arrangements. Funny if the scientists had suspended emigration to that glorious planet without advising him. From the moment of discovery they had treated him as one of themselves.

Frowning, Pendrake crossed the street and peered through the window. But the smaller sign that had once graced its interior, giving accurate yet carefully worded details to prospective emigrants—that sign was gone, too.

Beyond the window frame, considerably beyond, a woman sat at a desk. Her back was to him, but one glance showed that she was not Mona Grayson, the daughter of the inventor of the atomic engine.

Mona Grayson had been small, slight of build. This woman was broad in every beam right down to her thick ankles.

Shrugging, Pendrake went to the door. It opened at the barest touch of that strong hand of his.

"Bin dere anyting you vant?"

The broad German accent was like a slap in the face. Pendrake halted, then slowly walked around to the front of the woman's desk. He stood there staring at her.

She had a plump face, dark hair, dark eyes; and after a moment the very grossness of her appearance, the very unvarnished quality of her guttural, broken English brought easement to his strained nerves.

She might be Jewish; and besides, what the devil, anyway? There had been plenty of refugee scientists and their families. For all he knew, this was a member of such a family. He caught himself.

"Is Dr. Grayson in?"

"Vot name shall I gif?"

Pendrake winced. "Pendrake," he said grudgingly. "Jim Pendrake."

"Vrom vere?"

Pendrake made an impatient gesture with his single arm toward the closed door that led to the other tower. "Is he in there?"

"I vill send your name in if you vill tell me vere you are vrom! Mr. Birdman vill explain everyt'ing to you."

"Mr. what?"

"Vun moment, und I vill call him."

Pendrake tensed. There was something wrong, just what, wasn't clear. And this comic-opera caricature of an information girl wasn't helping matters. For some reason Grayson and the others had given up these towers as a center of interplanetary activity, and a bunch of Germans had taken over the building.

He looked up with abrupt decision. "Don't bother to call anyone. I can see I've made a mistake. I—"

He paused, closed his eyes, then opened them again. The pearl-handled revolver was still peering at him over the edge of the woman's desk.

"If you make vun moof," she said, "I vill shoot you mit dis noiseless gun."

A stocky man came into view. He had sandy hair, and freckles; his gaze played swiftly over Pendrake, lingered momentarily on the latter's empty right sleeve, then he said softly in perfectly colloquial American:

"Good work, Lena. I was just beginning to think we'd gathered up all the threads, and now here comes another. We'll put him in a space-suit, ship him by truck to Field A. There's a plane due there in half an hour. We can quiz him later on. He must have a wife and maybe some friends—"

After an hour, the horrible, jarring ride was over; the chains were taken off the suit that inclosed Pendrake. As he sat up dizzily, he saw a house and other buildings, and standing among them a small cabin-model, propellerless plane.

One of the truckmen motioned with a gun. "Get over there."

Three men were in the plane. They wore the same kind of metal-plastic suits as Pendrake had, and they said nothing as he was pushed aboard.

One of them indicated a seat; the man at the controls pushed a lever and, soundlessly, the machine began to move forward—and up. The utter silence of the immensely potent movement was all Pendrake needed. Here was a Grayson atomic engine.

With startling suddenness the sky grew dark-blue. The sun lost its roundness and became a shape of flaring fire in a universe of night.

Behind the plane the Earth began to show its roundness. Ahead glittered a growing orb of moon.

The phone lights misted: "Birdman speaking, excellency."

The ice-cold voice at the other end said: "You will be glad to know that after only three days we have all the necessary data on the man, Pendrake. As you know, it is imperative that we locate for questioning every person who might have some knowledge of the Grayson atomic engine, and do so without creating the slightest suspicion against ourselves. You will, therefore, carry out the following orders with respect to Mrs. Grayson—"

The misty light faded slowly; and the stocky Birdman shook himself like an animal coming in out of drenching rain.

He walked swiftly to a cabinet in one corner of his office. It opened at his touch. Liquor bottles gleamed at him. Almost without looking he snatched one, and poured himself a glass of amber stuff—drained it at a gulp.

He shuddered as the violent concoction billowed inside him, and then slowly he returned to his desk. Funny, he thought, how the sound of *his* voice always affected him so strongly.

II.

MANIAC KILLS SERVANTS, KIDNAPS WIFE. EX-AIRMAN JAMES PENDRAKE SLAYS FIVE. IS DRAMATICALLY ACCUSED IN NOTE WRITTEN BY DEAD SERVANT.

Crescentville, Aug. 23—In a dramatic note, written by a maid servant as she lay dying, James Pendrake, one-armed former airman and husband of Eleanor Pendrake, was accused of murder and kidnaping. The story of the only other witness to the crime, Major Ned Hoskins, Washington patent attorney and friend of the Pendrakes, has not yet been released by Air Force authorities who—

"Major Hoskins," said the Air Force officer presiding, "just how far were you from the white house on the Pendrake estate when you first noticed something wrong?"

"About two hundred yards," Hoskins said quietly.

"Under what circumstances were you there,"

"I had received a most confused phone call from Mrs. Pendrake. Her husband had been away three days without calling her, and her calls to his hotel in New York had produced the information that he hadn't been in his room since the day of his arrival.

"She then, she informed me, called up several friends and—this is where my confusion comes in—the people involved were all dead or missing. She babbled something about an atomic engine, and an organization that was transporting emigrants to Venus."

"She was quite hysterical, was she?"

"I would say so, yes. I told her finally that I would fly up that afternoon to see her."

"Just what is your relation to the Pendrakes?"

"Pendrake and I were in the same air squadron in China. However, we quarreled two years ago over something significantly related to what has happened here."

"Explain yourself."

"He came to my office two years ago and told me he had found a remarkable engine. However, it had been stolen from him by force, and he was anxious to trace the ownership. I took Air Commissioner Blakeley down to see him; and he insulted Blakeley in such a fashion that I broke off our friendship. I suppose Blakeley and I should have realized there was more behind Pendrake's refusal to talk than bad manners, but I must admit I was too furious to reason about it.

"I subsequently regretted my ill temper, but I didn't quite know what I could do about it. You may check all this with Blakeley. I believe he is ill at the moment."

"Yes. At what time did you arrive in Crescentville?"

"About half past three."

"What did you do?"

"I couldn't find a taxi. Walking along the main street, I suddenly noticed there was a LETSTOP meeting at the church. Unfortunately, I didn't have my masks with me, but I went in and spent ten minutes describing what had happened to me in a Jap prison camp."

"It was after this meeting that you went to see Mrs. Pendrake?"

"Yes."

"You walked?"

"It was less than a mile, and very pleasant, mostly under trees; and I reached the little bridge which crosses Pendrake Creek about two hundred and fifty yards from the house at twenty-eight minutes after four. I know that was the time because I looked at my watch. A minute later I emerged from the shelter of the trees and there was the Puma cabin plane drawn up on the road in front of the house, as I have already described in a written statement."

"I'm using that as a basis for my questioning. The sight of the plane surprised you?"

"It did. I couldn't see how it had landed. The road offered no runway to speak of. And then I saw that it had no propeller. That made me think it must have been there for quite a while.

"It is that propellerless part of your story I want to question you about. But first—what happened next?"

"Horrible screaming of women followed by the clatter of machine guns." Hoskins shuddered. "I can just picture those women suddenly realizing they were going to be murdered."

"What then?"

"Four men came out, one of them carrying the limp body of a young woman."

"You recognized her as Mrs. Pendrake?"

"No, it was too far to see faces. I only assume now that it was she."

"Ah! Enters the element of doubt. It was too far. You couldn't recognize faces—or the presence of propellers?"

"I didn't say that!"—sharply.

"All right, all right, let that pass. The four men emerged from the house, climbed into the plane with a woman and—"

"The plane made a run measurable in feet, then rose straight up into the air."

"Ah, yes, yes. But let's skip that, too, for the moment and return to the men. Was one of the murderers a one-armed man?"

"I don't think so."

"But you won't swear it?"

"I am convinced I would have noticed. When I first learned two years ago that Pendrake had lost his right arm in a crash, it was a great shock to me. You may recall that Pendrake was the Air Force's Man of Steel. He was the greatest physical personality of the war. Knobs came off when he opened doors hastily. When he was excited, objects he was holding lost their shape. He—"

"But you won't swear he wasn't there?"

"No-o!"—reluctantly. "I was lying in the ditch in a very amazed frame of mind."

"In the ditch—you weren't being very brave!"

"To the contrary, I felt no fear. I saw everything that happened with absolute clarity."

"But you were in the ditch, safe?"

"I was indeed. If I had been excited, I would probably have dashed forward to my death. As it is I am here alive, an earnest testimonialist to an astounding event. I saw a propellerless plane shoot up into the air like a bullet."

"We'll come to that. What did you do when the plane had departed?"

"I rushed forward and into the house intending to phone Crescentville. In the hallway I stumbled over the body of the first woman. In quick succession I found the bodies of two men, a big Negress and a maid. It was the maid who was clutching the note, in which Pendrake is accused of the crime, an obvious frame-up because the girl didn't have time to write anything."

"The frame-up is not so obvious to the rest of us. But let us go on. You—"

The stocky man reached the hotel through the secret entrance. He felt himself scrutinized, but finally the door swung open. He was led along a corridor. A few minutes later he was in the inner sanctum.

"Excellency!" He bowed.

The tall, gaunt man stared at him from eyes that were like shining holes in his head, so hard and bright were they.

"Herr Birdman, I have seen the newspapers. There was a witness."

The stocky man gurgled: "How could the men know? The accident was as mindless as our discovery of all this. Hoskins' presence at that moment—"

"I am not interested in reasons. However"—the cold voice thawed—"I have been reliably informed that Air Force higher-ups regard Hoskins' story as fantastic. They favor the more rational explanation that Hoskins was not half so calm as he tried to make out. In any event they haven't the faintest idea what to do.

"Major Hoskins remains a danger center. But killing him might kindle an interest in his story that he himself, living, cannot arouse.

"There are still a few problems. We must remain alert, prepared for drastic action. But on the whole I think we are justified in drinking to the successful conclusion of what might have been a dangerous incident."

Birdman accepted the proffered glass, and waited as the glittering eyes measured him. Finally, the man's bony hand came up; his voice rang out:

"To final victory—Heil Hitler!"

"Heil Hitler!" Birdman echoed.

Afterward he babbled wanly: "I admit, when I saw there had been a witness, I was worried. There seemed a destiny in that which seemed to lead straight toward the Shaposhenko—"

He stopped short. The smoldering eyes were like pools of fire glaring at him. The stocky man shivered.

"Heil Hitler," he said hastily. "All I meant was—"

He was cut off, icily: "This fear of the Shaposhenko punishment," said the steely voice, "is one which I shall not tolerate. You may go."

Birdman went.

III.

He was lying in darkness.

Pendrake frowned. He remembered the fight with the three Nazis—stilly fools, they hadn't considered a one-armed man dangerous—and he remembered the crash landing on the Moon.

He hadn't planned the crash. But things had happened swiftly; and in the final issue there wasn't time to learn exactly how the German controls of the space drive worked.

Yes, the crash and what preceded it was clear enough. It was the darkness that—

Pitch-black it was; and space hadn't been like that. Space had been a velvet curtain pierced with tiny brilliants; and the sun flashing and flaring through the portholes of the hurtling plane— Darkness, but not like this.

Pendrake frowned again. And with sudden will he tried to move his arm.

It moved reluctantly, as if quicksand was clinging to it. Or as if it were buried in sand—

His mind leaped in an immense comprehension. Powdered pumice stone! He was lying in a "sea" of settled stone dust somewhere on the side of the Moon that eternally faced away from Earth; and all he had to do—

He burst up out of the prison of dust and stood blinking in the ghastly glare of the sun. His heart sank. He was in a vast desert. A hundred yards to his left a plane wing protruded from the sand. To his right, about a third of a mile, was a long low ridge across which the sun's rays fell slantwise, creating dense shadows.

The rest was desert. As far as his eyes could see was that dead level of pulverized pumice. Pendrake's gaze returned to the exposed wing, and with a stark intensity he thought: "The engine!"

He began to run. His strides were long and bouncy, but he knew from past experience what low gravity was like. And after a moment, now that hope had come, even the consciousness of low-weight became a dim force at the back of his mind.

For there was hope. Damage to the structure of this supership didn't matter. Wings could be torn off, body smashed and bent. But so long as the engine and the drive shaft were intact and attached, the plane would fly.

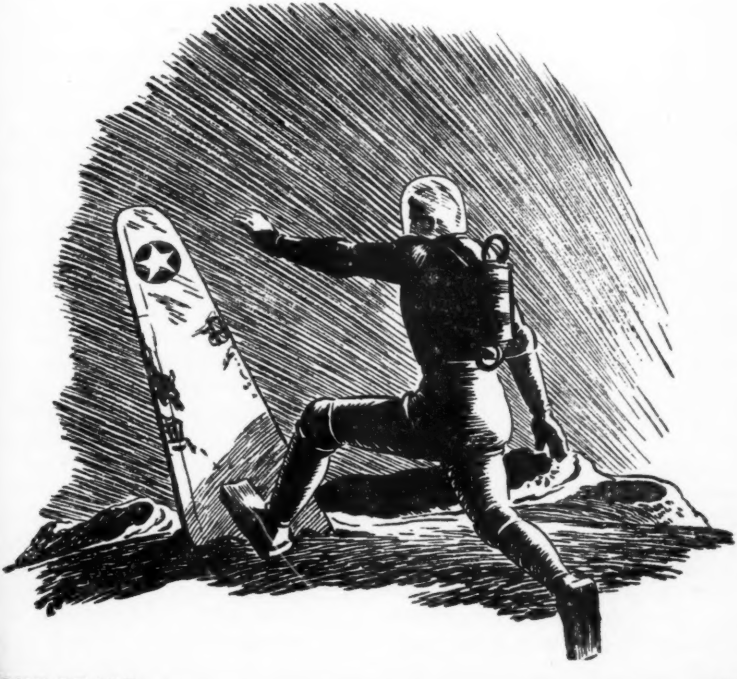
It was the almost vertical tilt of the wing that fooled him. He used a loose metal plate and excavated doggedly for what must have been half an hour. And then he came to the torn end of the wing.

There was nothing below, no plane, no engine, no tail gear—nothing but pulverized pumice.

The wing poked up into the sky, a mute remnant of a plane that had somehow shed a part of itself, and then soared off into eternity. If the laws of chance meant anything, the plane and its engine would fly on forever through space.

But there was still a chance. Pendrake began to walk hurriedly toward the ridge. The slopes of the ridge were steeper than he had estimated; and they were buried in black shadows. Hard to see; he kept sliding back, the loose-packed dust coming down in little rushes. After minutes of effort, he was still only halfway to the top of the two-hundred-foot hill.

And it was getting cold. At first the chill hardly touched him, but it swiftly became a biting cold that pressed against his skin, and began to steal inside clammily.



Within minutes his whole body was numbed, his teeth chattering. He thought in stark amazement: The suit, the damnable suit must be so constructed as to distribute evenly the direct and terrible heat of undiffused sunlight, with no allowance at all for cold.

He reached the top of the ridge, and stood with closed eyes facing into the full blaze of the low-hung sun; sluggishly the warmth began to flow back into his veins; he remembered his hope, and looked around, looked long and with a gathering desperation.

But the plane hadn't merely dropped its wing, and then crashed at some near point. In all his scope of vision, the flat reach of pumice sea was unbroken except for seven craters that reared up bleakly in the far distance, like witches' mouths sucking at the sky.

He had walked for over an hour toward them, the metal plate "shovel" still clutched in his fingers, before it came to Pendrake suddenly that the sun was lower in the sky than it had been.

Night was falling.

He was one man alone running from crater to crater while a fantastically flaring sun sank lower and lower in a sky that was darker than the midnight heavens of Earth. The extinct volcanoes were all small, the largest only about three hundred yards across.

The long shadows from the slanting rays of the sun fell across those crater bottoms; it was only by light reflections from the walls that Pendrake was able to see that here, too, the pumice ocean had spread its silent, enveloping waves of dust.

Two—four, five craters; and still there was no sign of what he was looking for. As with the others, he climbed the sixth from the sunny side, and then stood sickly peering down into the black shadows of the shallow pit that spread before him.

Pumice, ragged edges of lava, protruding piles of rock that were darker than the shadows that engulfed them—it was all such a familiar pattern now that his eyes made automatic assessment and flashed on in a dull dismay.

His gaze was a hundred feet past the cave entrance on the far bottom before he realized that he had succeeded in his search.

He felt himself on the verge of eternity. The rim of the crater seemed sandwiched between the light-sprinkled blackness of space and the hard protrusions of the dead volcano. He raced on.

The sun was a blob of flame in a velvet sky. It seemed to quiver to his near right, as if balancing for the downward plunge. Its light cast shadows that seemed longer and more intense with each passing moment; every rill, every unevenness had its own bed of darkness.

Pendrake avoided the shadows. They were wells of cold that numbed his legs when he bounded into them. He thought finally, with utter desperation:

The suit couldn't be as bad as this, suitable only for sunlight. It must have some arrangement for heating when there wasn't any sun. It was made for space, for the Moon where darkness reigned supreme for two solid Earth weeks of every four.

Grayson and the scientists hadn't had spacesuits. It was something the Nazis must have developed—forced by their difficulty to obtain the metal necessary to construct large spaceships, they were putting atomic engines into ordinary planes and the pilots into spacesuits. Clever!

But surely to heaven they had installed some kind of power unit in a spacesuit that actually worked in space. No mean feat of invention in itself as any airman knew who had ever worn a war-time stratosphere suit with all its imperfections.

There *must* be something. He could wait till he reached the cave entrance, and then—

And then he stood using his flexible metal and plastic arm with its equally flexible fingers, searching for some kind of heat switch.

But there was only the flashlight. He turned it on. The sun was a quarter wheel with streamers, an arclike shape of light standing upright on the ground to his left. The Moon surface itself, except for the protruding craters, was in darkness, a pitlike, mind-shaking darkness.

Pendrake shuddered, and leaped down to the first level of the cavern. The beam of light from his headpiece showed the floor was pumice dust.

The frightful cold pressed in on him as he dug. Even violent movement wasn't enough now, as it had been so long as part of the sun shone at him. The cold ate at his strength. The plate kept slipping from his numbing hand.

Like a tired old man he finally lay down in the shallow trench he had scraped in the dust. With a frantic will, he began laboriously to cover himself.

His last physical effort was an attempt to push his arm through the covering dust toward the flashlight switch in his headpiece. Mustn't use up precious power, he thought vaguely.

The curious thing was that he pushed his arm halfway up, paused for a desperately needed rest—and forgot its purpose. There was something, it seemed to him, something. He gave it up, and lay there, his body like a cake of ice, his cheeks curving plates of cold.

The conviction came that he was in his grave.

But the life force in him was tenacious and unyielding. He grew warmer. The ice went out of his bones, his flesh began to tingle, his numbed hand grew fiery with pain, and his fingers thawed.

The animal heat of him spread through the suit, a rich, luxurious force. He couldn't get as warm as he would have liked. The temperature was too low for that. After a long while it struck him that lying here was no solution to anything.

He must get deeper, deeper into the Moon's pitted interior. It *must* be warmer farther down. Friction alone, the friction of semiviscid rock and metal, product of the Moon's own tortuous writhings, would create a special higher temperature which would be held in by the insulating pumice and lava of the surface. There was, of course, the question of food, but—

Pendrake was struggling now to get out of his pumice grave; and with a snap of his will he pushed the thought of food out of his mind. Climbing to his feet, he switched on his light, and began to work his way down.

The path was a twisted one, as if once the cave might have been the tubular funnel of a live volcano—pulled out of shape by the shifting of the Moon's crust.

Down, down, slantingly down. How many times he sought warmth in a bed of dust Pendrake had no memory. Twice he slept, for how long he had no idea at all. It could have been a minute's doze; it might have been hours each time.

The cave was timeless. A world of night through which the light from his helmet poked at intervals like a thin flame. He had no mercy on himself, but plunged down, often at a dead run, after a brief flicking on of his light to reveal possible dangers.

Other caves began to branch off from the main cavern. Sometimes they were plainly nothing but branches. But when a possibility of confusion existed, Pendrake forced himself to stop, to stand there while the hideous cold ate into him—stand there and clearly mark an arrow to indicate the direction from which he had come.

He slept again, and then again. Five days, he thought; and knew that he might be fooling himself. A body so subjected to deathly cold must need more sleep than normal to recuperate. All his great strength could not ward off such a reaction of the human system.

But five sleeps—five days. Grimly he counted them in full, and added each sleep as one day—six, seven, eight, nine—

Gradually, it grew warmer. For a long, long time he didn't notice that. But finally the consciousness penetrated that the intervals between those frantic burial parties of his were lengthening.

It was still bitterly cold on the tenth "day," but the chill was a slower pressure, not a biting, tearing thing. The warmth stayed longer inside him. For the first time he could walk along and clearly realize that he was a doomed man.

Other thoughts came, too. He ought to start back up again, back toward the surface where the sun would soon be shining. And once on the surface he could make a desperate two-weeks' search for one of the Nazi camps.

In a way that purpose seemed silly, stupid. For—the question became a blank wonder in his mind—what would he do if he did find such a camp? There was Eleanor, of course, but—

The very vagueness of his plans eroded his will, already long weakened from the pangs of hunger, and by a thirst so terrible that every minute seemed an hour, every second a bit of hell.

Turn around, his mind said. But his feet went on unheeding, down and down. He stumbled. He fell. And got up again. He made the narrow hairpin turn that led to the lighted corridor almost unseeing. And he was actually stepping across the entrance before the reality of it smashed at him.

With a single, mindless plunge, Pendrake dived behind a big up-jut of rock. He lay there quivering, so weak, so ill from reaction that for minutes his only thought was:

The end had come.

Recovery came hard. His nervous energy, that extraordinary reservoir of his great strength, was a worn and tattered thing.

But after a while his spirit surged once more into life. Cautiously, he peered over the needle of rock behind which his spacesuit-clad body slumped. He was crazy of course to think that he had seen moving shapes in the distance, but—

The corridor stretched before his gaze on a gradual downward slant. His first intense glance showed that it was empty of life. It took a long moment after that to grasp that it wasn't lighted by electric bulbs, and that his initial impression, that light meant Nazis, was wrong.

He was alone in an old cave deep inside Earth's satellite, like a worm that had crawled along a dried-out artery of somebody's crumbling flesh.

Only no worm had ever suddenly run into a tunnel the walls of which shed a dull radiance.

The lighting was not even in texture, nor was it spaced according to any distinguishable pattern. As he walked cautiously forward, points and splashes of light shone at him. There was a long, trembly line on the right wall, and a rough crescent on the left, and other shapeless and meaningless forms glowed and blinked along the corridor as far as the eye could see.

Pendrake thought sharply: Some kind of radiant ore which might be harmful—

Harmful! His laughter echoed Homeric inside his headpiece, cut new cracks into his thirst-swollen lips, and ended abruptly as the pain grew unbearable. A man on the verge of death didn't have to worry about new dangers.

He plunged on, for a while heedless. And then slowly the presence of the light penetrated anew. The truth burst upon him suddenly as he paused at a turning and found himself staring down a long slant at a corridor of light that faded into a point of distance.

The corridor was artificial!

And old! Incredibly, fantastically old. So old the walls, that must have been as smooth as glass and harder than anything human beings had ever made, walls radiant in every element, had crumbled before the relentless pressure of ten, twenty, thirty million years. Crumbled; and this sheltered, twisted, light-splotched tunnel was the result.

He stumbled on; and the curious cunning thought came that the radiance would enable him to save his flashlight. For some obscure reason that seemed immensely important.

He began to giggle. It seemed suddenly irresistibly comic that he who was about to die had happened at this ultimate moment of his life upon an underground universe where beings had once lived.

His giggling became a wild, uncontrollable glee. Finally, however, it ended from sheer exhaustion, and he leaned weakly against the wall, staring down at the tiny river that washed across the cave, burbling out of a big crack in the rock and whirling out of sight into a hole in the opposite wall.

"I'll just cross that stream," he told himself confidentially, "and then—"

Stream!!! His mind did a somersault so terrible in the nausea it brought, so *physical* that he staggered and fell like a stunned animal. The crash of metal and plastic on rock resounded in his ears; and the shock, the clangor brought back a measure of his sanity.

He grew more alert, more conscious, came further out of his terrible stupor.

Water! The surprise of its presence struck him more sharply. The thought, the comprehension grew so big that it projected clear through his brain and down into his muscles, and was still too big.

Water! *And running!* Come to think of it there hadn't been any cold for a long time. Have to get his head free, air or no air. Somehow he'd survive if he got the water. It—

He climbed unsteadily to his feet, and saw the men coming toward him. He blinked at them, thought finally in a frowning astonishment: No armor, no headpieces! Queerly dressed, though. Funny!

Before he could think further, there was a scramble of footsteps behind him. He whirled to see a dozen men bearing down from that direction. Instantly, knives flashed. A raucous voice yelled:

"Kill the dern critter. Dirty furrin' spy!"

"Hey!" Pendrake breathed hoarsely.

His voice was lost in a chorus of bloodthirsty yells. He was shoved, flung; and he hadn't the strength even to lift his arm. At the very moment that the club struck him slantingly on the head, his amazement reached its peak; amazement because—

His assailants were not German!

IV.

A missing ex-airman, his kidnaped wife, a curious two-year-old story about an atomic engine—those were the threads. In all those vital days there seemed nothing else.

But there *was* another thread.

August ended. The Earth sighed as it turned on its axis; and a thousand winds blew in their thousand directions. September 1st flashed across the international date line; by the time it reached the eastern American seaboard, a northeaster was blowing; and a score of meteorologists drawing their isobars noted laconically that winter would be early this year of Grace, nineteen hundred and fifty.

By midafternoon of September 1st the hidden thread was coming up into the open. Air Commissioner Blakeley recovered from a bad case of influenza, and returned to his office. In catching up on events, he came across the interview of Major Ned Hoskins, patent attorney, by one of his staff officers.

"Pendrake," he mused, then flushed with remembered humiliation. "That was the one-armed chap who threw me out of his house, then sometime afterward sent me a list of names and addresses of atomic scientists and—"

His thought stopped. A storm of blood hammered at his temples. "This could ruin me!" he thought.

After a little, very white, he sent for Pendrake's file and reread the letter with its list of names: Dr. McClintock Grayson, Cyrus Lambton—come to think of it he'd read about the death of those men in an accident and— This thing looked bigger every instant.

Sweating, he read his own reply to Pendrake's letter, "—Further correspondence would be useless—"

For a long minute he stared down at the damning document. Finally, his jaw stiffened. He reached for the telephone.

"Get me Cree Lipton of the Federal Bureau of Investigation."

The phone lights in the stocky man's private office misted, then came bright and clear. He said thickly:

"Herr Birdman speaking, excellency. What do you—"

He was cut off: "I have just received word from our Washington agents that the F. B. I. has been called into the case. Carry out Plan D at once.

"Kill Hoskins," the steely voice went on. "I place you in full responsibility. Hoskins had been in Crescentville for nearly a week tracing Pendrake's movements; he has already discovered the hole in the hillside where the engine fell that originally brought Pendrake into the affair. And he has photographed the images in the electrons in the surrounding earth with excellent confirmatory results even after all this time.

"Now that action is being taken by the government, the reason for denying him death no longer exsists. That is all."

There was a click.

It was the afternoon of September 2.

Ned Hoskins glanced at the placard on the announcement board of the Crescentville All-Denominational Church—and stopped short, settled his heels hard on the dusty cement of the sidewalk. He stood there under the glare of the midafternoon sun, a lean, fastidiously dressed young man. With bleak-eyed hostility, he reread the words on the placard:

LETSTOP
(Let's End the Shaposhenko Type of Punishment, Inc.)
PRESENTS
A VIGOROUS SPEAKER
WHO WILL ASSAIL THIS
INCREDIBLE BLOT ON THE
CHRISTIAN WORLD
SIGN PETITION
END HATRED OF EX-ENEMY
NATIONS
THIS AFTERNOON AT 2:30
ADMISSION FREE

Hoskins' watch showed twenty minutes after two. He scowled viciously. Damn these LETSTOP people. The second meeting within ten days. Well, this time he did have his masks. But—

It had turned hot after a cool morning, a close, dry heat that made his face tingle with tiny tremors of the old pain. There was still the extra edge of needling in his right cheek where the plastic surgeons had to cut deep, long ago now.

Hoskins fingered the pain spot; and, narrow-eyed, watched the people trickling into the church. By ones and twos they came, mostly women, but there were some men, too—oldsters, one youth and a middle-aged businessman type.

Staring at them, he felt no sympathy at all; and after a moment he shrugged with the knowledge that he couldn't shirk what had to be done here. First this, then seek out the cool environs of his hotel room.

He hurried back to his hotel, took his two masks out of his suitcase, and put them on—first the mask that had been made of his face before the surgery, and then the mask of his face as it was now.

It seemed hotter inside the church, or maybe it was just that the masks closed his pores and stifled him; and besides, there was the vest he was wearing. The speaker was in full frenzied voice when Hoskins slid into a seat near the front:

"—And I say to you that *we* are the ungodly, the cruel, the merciless, *we* who have supported this atrocity against fellow human beings—"

He was a small, well-built man with a husky, rather appealing voice that yet had a penetrating resonance:

"We have won the war; we must now win the peace. The Captain Shaposhenko punishment is the vilest ever spawned by a hell-inspired, hate-inspired—"

At last the violent gestures slowed, the throaty voice sank to a skillful beseeching note:

"I have a petition form here—as soon as the question period is over. Any questions?"

Hoskins stood up. As he turned to face the audience he saw the doors of the church open slightly and the snout of a machine gun poke through.

"And they've got me cornered here in this little town," he thought.

The first burst of bullets caught him squarely on the chest.

The blows were heart-wrenching, like hammers smashing at him. Hoskins had the brief, terrible fear that he was going to faint, but with a body-twisting jerk he managed to fling himself down between the benches.

The second burst of bullets sprayed where he had been.

From somewhere near came a woman's high-pitched scream. Grasping his armor-lined bowler hat in a sweating hand, Hoskins rolled over and over beneath the benches. With frantic effort he kept tugging at the gun in the shoulder holster that was attached to his bulletproof vest.

Suddenly, the firing inside the church ceased. But there was firing now *outside*. Cautiously, Hoskins scrambled to his feet.

One lightning glance showed the machine gun was gone from the door. Instantly he raced along the aisle.

The outside shooting had stopped, too, but there was in its place the deep-throated roar of many engines. As Hoskins teetered to a halt at the top of the church steps he saw—

A half dozen black cars were drawn up blocking the road that led past the railway station. A long gray machine was swerving sharply, trying to turn; it succeeded and came careening back down toward the church—just as other black cars pulled out of a side street and bore down upon it from the opposite direction.

The gray car slowed, hesitated, and for the first time Hoskins grew aware that *its* engine was making no noise. With a hiss of indrawn breath he realized what was going to happen.

The gray sedan rose, like a thistledown it rose into the air and climbed straight up like a shooting star in reverse.

It became a dot in the sky and headed into the blue mists of immense heights. Just before it vanished, Hoskins had the curious impression that a long torpedo-shaped structure was waiting up there.

It was there; and then it wasn't. Gone, too, was the car. Hoskins shook his head, thinking hazily: It could have been a trick of his vision.

But he knew better. A torpedo-shaped spaceship was not at all out of place in the tremendous game that was being played here.

Abruptly, there was no time to think further. Shouts and cries were coming from the interior of the church behind him.

Someone was screaming: "She's dead—her face shot away!"

Hoskins felt cold and immune. He thought steadily: "I lost my soul in the war. I watched too many good men die to worry now about a LETSTOP sympathizer."

He stood staring moodily at the men who were debouching from the black cars. One of them, a knob-jawed giant, came racing up the steps.

"Hoskins!" he breathed, "you *are* Hoskins. And you're alive."

Hoskins said in a monotone: "You unimaginative fools! Why didn't you have planes overhead? Coming here like a bunch of ground hogs! If you could have shot down that auto with its engine—"

He stopped himself with an effort, shrugged grimly: "Not that planes would have done any good," he confessed slowly. "That car was armor plated, a regular battle tank if I ever saw one."

The knob-jawed chap was rubbing his chin ruefully. "I'm afraid Hoskins, you've got the wrong slant on a peacetime United States. We came, automobiles and all, by the fastest big plane transport in the world, landed on the highway just outside of the town. But it'll be another hour at least before fighter planes are tuned up and ready for flight."

The man's deep voice quickened. "The important thing is, we didn't wait for them, and you're alive. Man, quick, tell me, what do you know? Why did they want to silence you? Here's my identification: Cree Lipton. F. B. I. Now tell me."

Hoskins stared at him wryly, he said finally: "I know that there's a superengine in existence."

"Yes, yes"—Lipton frowned at him—"we know that, too, now. But what else? What did Pendrake tell you?"

Hoskins drew a deep breath. "I know nothing else," he said.

"Eh!" Then slowly the shock faded from the F. B. I. agent's face. "I see. We actually know more than you do. We've discovered that seventeen leading atomic scientists and their families have been murdered or are missing. It all happened about eight months ago, and the crimes were so thinly spread out over the country that only a few scientific journals commented on the deaths. In addition we've had this experience in every raid we've made—"

He took an envelope from his pocket, drew out a newspaper clipping and handed it to Hoskins, who read:

FIRE GUTS FIFTIETH STREET TOWERS

Sept. 2nd—The strange turreted towers, formerly occupied by the Cyrus Lambton Back-to-the-Land Project, more recently by the head offices of the trucking firm of Fred Birdman, was completely destroyed at noon today by a fire of undetermined origin. The twin towers, which were located at—

"Birdman has vanished utterly," Lipton said. "The question therefore is, what now?"

Hoskins scarcely heard. He stood staring sardonically at the sign which had announced the LETSTOP meeting.

In the scramble it had somehow been knocked loose, and lay now face down in the dirt.

Where it belonged, he thought grimly.

The stocky man sighed with relief. Just what he had expected he couldn't define exactly, but certainly not this—not this philosophical attitude on the part of the leader. Even the smoldering eyes seemed calmer, less feverish.

"It is the fortune of war, Herr Birdman," the tall man shrugged. "The enemy acted with admirable speed and decision, and he now knows that some American scientists invented an atomic engine, and operated spaceships from the very centers of their cities. He knows, too, that the so-called defeated Nazis now have the engine and are putting it to nefarious uses. There is a psychological value to us of such knowledge. It will revive the bolder spirits among our good German people to new hope. The young men will grow up expecting, waiting to be called. Meanwhile, safe in space, we shall develop until we are ready to strike."

He frowned thoughtfully at the floor. "There are certain precautions we must take here on Earth, beginning with the removal of doubtful elements. Particularly, we must be prepared for new restrictions in the Reich itself. I shall appoint a co-ordinating committee.

"As for the situation on the Moon, one of the engineers in Factory L, Herr Steulpnagle, to be exact—"

"A good worker for the Cause," Birdman nodded.

"Precisely," said the other coldly. "He has now requested permission to marry Mrs. Pendrake, and as you are leaving today for the Moon, I want you to instruct Mrs. Pendrake to prepare for marriage in a month's time.

"As for Pendrake himself, we must not assume that he is dead. His trail from the shattered plane wing led to a cave in the crater. A cursory investigation showed that he was still alive at a depth of one mile, but that he was burying himself at intervals, and therefore had only discovered the auxiliary heating mechanism attached to the flashlight and not the main switch.

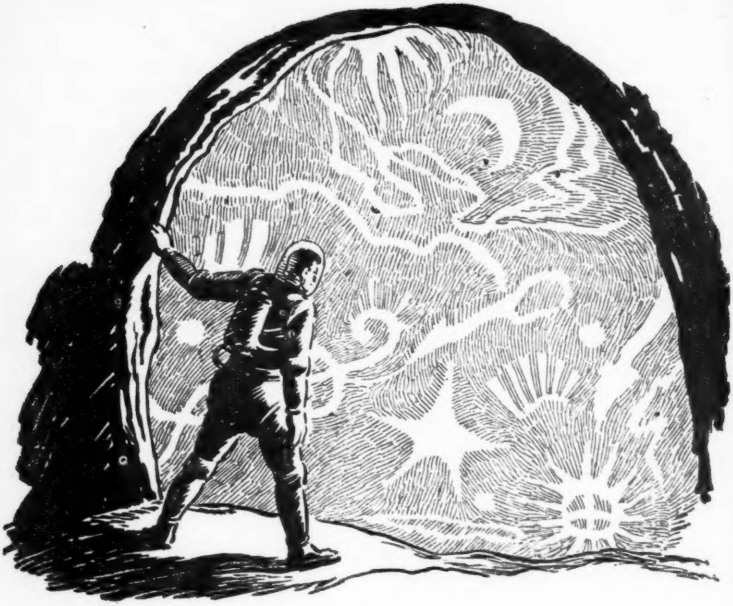
"To make sure of him, I think we must now be prepared to organize a military campaign against the cave dwellers; we have tolerated their depredations long enough—"

V.

Pendrake wakened to the sound of a melodious humming. It was somewhere off to his left, but for a moment the delicious weakness of his every nerve and muscle, the odd physical pleasure of just lying on something soft and comfortable, drained the inclination in him to turn his head and look at the man whose tuneful warbling had aroused him.

After a moment, it struck Pendrake with a sharper consciousness that he was alive; and that that didn't fit with what had gone before.

But still he lay there. And after a little he found himself frowning in amazement at a lighted cave roof that must have been a mile high. He closed his eyes, shook himself,



then opened his eyes again. But that tremendous roof remained. What had been a narrow snake of a cave had somehow opened out, and here was an underground vastness.

The sight quickened his whole being. He grew aware of a thin breeze that touched his cheeks and brought a sweet scent of growing things, an odor of garden and trees in bloom.

Pendrake stirred in a gathering excitement. The movement brought his first awareness that he was no longer arrayed in the spacesuit.

The movement did something else. It ended the humming. Footsteps sounded. A young man's voice said:

"Oh, you're awake."

The speaker came into view. He was a slight-built young man with a thin face and bright eyes. He wore a curiously old-fashioned, threadbare coat, and his legs were incased in trousers that were strapped under his shoes. He said:

"You've been unconscious for four sleep periods. I've been squeezing water and fruit juices between your lips every little while. You must have been lost in the upper caves at least a month. My name's Morrison, by the way."

"Lost only ten days!" Pendrake

said; and then he blinked, for no words had come, nothing but a hoarse rasping sound.

"Better not try to speak yet," the young man counseled. "You're still in a bad way. As soon as you're strong enough you're to be taken to Big Oaf for questioning—that's why you've been kept alive!"

The words didn't penetrate right away. Pendrake lay very still, thinking: He was insane to imagine that, because he had slept ten times, only ten days had passed. The cold, his terrible will to live, must have kept him going for days at a stretch.

Ridiculous to think that he had reached such a disastrous physical state in ten days when thousands of less strong men in the war had survived longer exposure in open boats, in trackless jungles, and on foodless plains and steppes. This fellow, Big Oaf—

Big *what?*

He muttered his amazement, and this time managed a husky whisper. The young man grinned at him:

"That's his name all right. Somebody called him that once, and he took a fancy to it; and nobody's ever dared to tell him the meaning. He's Neanderthal, you know. Been here a million years, at least, almost as long as the devil-beast in the pit."

A startled look came over the young man's face. "Oh!" he said in alarm. "I wasn't supposed to tell you that."

His panic grew. Gasping, he came down beside Pendrake, clawed at his arm.

"For Heaven's sake," he whispered hoarsely, "don't tell anybody that I told you how old we are down here. I've done my best for you. I've brought you back to life; I fed you. I was supposed to keep you locked up—I'm your guard, you know, and you're in jail—but I brought you out here and—"

He broke off: "Please, don't tell!"

His face was a twisted mask of fear—that changed. Changed to cunning, then to ferocity. Abruptly he jerked at the knife that Pendrake saw for the first time was in a sheath under his coat.

"If you don't promise," he threatened wildly, "I'll have to pretend that you tried to escape, and that I had to kill you!"

Pendrake found his voice. "Of course I promise," he whispered hoarsely.

He saw instantly in the distorted eyes above him that no simple promise could soothe the terrified creature who crouched over him. Danger made his whisper louder, stronger, as he said swiftly:

"Don't you see, if I know something they don't want me to know, they'll kill me out of hand. It's to my own interest to keep information to myself. You see that, don't you?"

Slowly, the fear died out of the young man's eyes. He climbed shakily to his feet, then he began to whistle softly. Finally he said:

"They're going to toss you to the

devil-beast anyway, they take no chances except with the women. But keep my name out of it, that's all, and anything I've said."

"Agreed!"

Pendrake whispered the word, and mustered the form of a smile, but he was thinking grimly: Sleep lightly. Watch out for a knife—in my sleep.

He must have slept while that thought was still forming in his mind.

His first, intense thought when he wakened the second time was: A man named Morrison—in the center of the Moon.

He had the abrupt conviction: Got to find out more about the whole business. Those men came from Earth, and have been here a long time.

There was a sound beside him. A thin, familiar face bent over him.

"Uh!" said Morrison, "you're awake again. I've been waiting, listening to you talking in your sleep. You talked a lot. I'm supposed to report everything you say."

Pendrake started to nod half to himself, his mind merely taking in the words; and then the greater meaning of them, the mental picture of someone—out there—someone named Big Oaf giving orders, cunningly receiving the reports of spies, granting temporary stays of execution—abruptly he felt outraged.

He sat up. "Look here," he began, "who the devil—"

His voice was clear and strong, but it wasn't that returned strength that stopped him short.

Below him was a town set in a garden of trees and flowers. There were broad streets, and he could see men and—queer!—uniformed women.

He forgot the people of the town. His gaze soared from horizon to horizon. There was a green meadow on the far side of the town where cattle grazed. Beyond, the ceiling of the cave swept down to a junction with the ground at some point below the cliff, a point invisible from where he sat.

It held him for a moment, that line where a radiant cave sky met a cave horizon.

Then his gaze came back to the town, to the gorgeous town. A hundred yards away it began. First there was a line of tall trees heavily laden with large, gray fruit. The trees sheltered the nearest of many buildings. The structure was small, delicate-looking. It seemed to have been built of some shell-like substance.

It glowed as if light was inside it, shining through its translucent walls. Its design was more that of a shapely bee's nest than of a sea shell, but the resemblance to the shell was there, too.

The other buildings that glinted tantalizingly through the trees differed widely in details, but the central architectural motif, and the basic glow-material was ever present.

"The town's been like that," Morrison's voice said, "since I came in 1853, and Big Oaf says it was like that when he—"

Pendrake turned. The mention of dates was staggering, but he caught at the wedge they offered. "And he's been around a million years, you said."

The thin face twisted uneasily. The man looked hastily around. His hand crept toward his knife. Then he caught Pendrake's eye, and he let go of the hilt. He was trembling.

"Don't repeat that," he whispered desperately. "I was mad to tell you, but it just came out, that's all. It just came out."

There was no mistaking the fear. It was real, and it made everything else real, the million years, Big Oaf, the eternal town below. For a long second Pendrake stared at the way the weakling's face was working, then he said:

"I won't say a word, but I do want to know what it's all about. How did you get here onto the Moon?"

Morrison shifted. A bead of sweat ran down his cheeks; Pendrake felt a stark incredulity that any man could be so frightened.

"I can't tell you," Morrison said in a panicky voice. "They'll throw me to the beast, too. Big Oaf's been saying that there's too many of us here ever since we abducted those German girls."

"German girls!" Pendrake ejaculated; and stopped himself short, his eyes narrowed to pin points. That accounted for the women in uniform he had seen in the streets. But what a hornets' nest these cave dwellers were stirring up for themselves—Morrison was continuing in his sharp tone:

"Big Oaf and his cronies are mad for women. Big Oaf's got five wives now, not counting the two that killed themselves and he sent another kidnaping expedition out. When they get back—well—he's just waiting for a chance to kill off all the decent men."

The picture was clearer now; the missing details fundamentally unimportant. Pendrake sat grim and cold, *seeing* the cataclysm that had brought hell to the Moon's garden of Eden. The stupid fools, Morrison and the others, he thought furiously, waiting like a bunch of frightened sheep for the slaughter, even humming happily during mindless moments.

He parted his lips to speak—and was cut off by a bull voice behind him, roaring:

"What's this, Morrison? The prisoner strong enough to sit up, and you haven't reported it. Get going, stranger. I'm taking you to Big Oaf."

For a moment Pendrake sat as still as death. The needle-sharp thought that came finally was: He was too sick, too weak. The crisis had come too soon, far, far too soon.

Thoughtful, alert, Pendrake walked along the street of the village. That he could walk at all was exhilarating. He couldn't dare try anything involving strength yet, but he simply must survive a few "days" longer—gain time to observe, correlate, organize the demoralized anti-Big Oafs.

His Air Force and science training stood him in good stead. He wasted scarcely a glance at the houses and the motley assortment of raggedly dressed men and the sullen women in their Nazi woman's corps uniforms barely touched the outer fringes of his thought. His mind, his whole being concentrated on control centers.

With abrupt understanding of the gestapolike regulation of vital supplies that was here, he noted that two half-naked men with blue skins and broad flat noses stood guard over a stream of water that gushed from a wall and gurgled out of sight through a hole in the ground. There were other places being guarded, particularly four large buildings, but the reasons for protecting them were not apparent at first glance.

Pendrake moved forward a few yards, then stopped. And stared. In almost the exact center of the town, half hidden by a growth of trees, was a stockade.

It was made of tree boles, lashed together. Tall it stood, presenting a hundred-and-fifty-foot front, fifty feet high, with a massive gate around which loitered a dozen men with spears, long bows and drawn knives. The structure looked obscene, ugly, utterly incongruous among the delicate hued, shell-like houses. But there was no doubt at all that here in this monstrous fort dwelt the central authority of his fantastic world.

The thought ended as one of the guards, a raggedly dressed individual who wore spurs on high boots and looked like a bad caricature of a cowboy, challenged:

"Takin' this feller in to see Big Oaf, Troger?"

"Yep!" Pendrake's bearded, bull-voiced escort answered. "You better search him, though."

"What about Morrison? Does he go in, too?" asked a black-eyed man in a shiny tattered remnant of what must once have been a black suit of some kind. It struck Pendrake with a start, as fingers poked eagerly through his pockets that this second guard resembled with startling fidelity a motion picture version he had seen of a gambler of the old West.

Pendrake felt a sudden, sharp fascination. In spite of himself, in spite of his will to waste not one glance on anything that might confuse, he grew more aware of the men.

They had been blurs to his vision; now they came into sharp focus: Men of all the periods of the West, an astounding assortment, even some that didn't seem to fit at all. But Pendrake felt not a shadow of doubt:

They were all Western American. It was as if in some incredible fashion a net had been cast from the Moon, and into that net had fallen men from every age of the western United States; and then the catch had been gathered here and, like this immortal village, kept immune from the ravages of time.

There were about a hundred men visible from where he stood at the gate of the stockade. Seven of them were Indians in loin cloths, red of skin, tall, arrow-backed. *They* fitted. And so did all the roughly dressed men in open-necked shirts and belted, narrow-legged trousers; and so did the ragged cowboys.

Morrison didn't fit, not quite, though there must have been clerk-ish types like him in Western towns. There were some short, ugly men and some very fine big, dark-brown men who didn't fit either; and there was another one of the half-naked, blue-skinned, flat-nosed men, but—

Whoever had collected this crew had gotten hold of some of the toughest characters that the old, hard West had ever bred.

A big hand grabbed his collar, pushed him physically and mentally out of his mood of appraisal.

"Get in there!" said the voice of Troger.

Pendrake's reaction was automatic. If he had thought, if he hadn't had to come so far out of his dark speculations, he would have controlled himself in time.

But the insult of being grabbed came too suddenly. His response was as violent as it was involuntary. His arm came up; his fingers caught the offending wrist; and for one brief instant every tired nerve in his body pumped power with the lightning speed that alone makes for tiger strength.

There was a roar of pain, and a hard thud, as Troger described a cartwheel in the air and landed twenty feet away. The man bounced up instantly, raging:

"I'll beat your brains out. No one-armed guy can—"

He stopped; his gaze fastened on somebody behind Pendrake, and his whole body grew rigid. Pendrake, trembling from the nauseation produced by his effort and stunned at his utter stupidity in revealing how strong he could be, turned dizzily.

A creature stood in the gate; and one glance was enough to identify it: Here was Big Oaf, Neanderthal monstrosity.

He was a man; he had a roughly human shape, a head with eyes, nose and mouth. But at that point the physical resemblance to anything human ended.

His figure was five foot four in height, and about three feet wide in the chest. His arms hung below his knees. His face was—beast; the teeth far too long, and projecting from between enormously thick lips.

He stood there like some nightmare out of hell, naked and hairy except for a black fur that hung from a strap around his belly. He stood slouching, and it took a long moment for Pendrake to grasp that the creature's piglike eyes were studying him shrewdly. Even as realization came, the thing parted those tremendous lips and said in throaty but unmistakable English:

"Bring the feller inside! I'll talk to him from my throne. Let about fifty people in."

The inside of the stockade was ordinary. There was a big, glowing, shell-like house, a little river of gurgling water, fruit trees, a vegetable garden, and a wooden dais on which stood a huge wooden chair.

The wooden chair was the throne, and it was obvious to the grim Pendrake that whoever had given Big Oaf the idea of kingship hadn't had too clear an idea of regal splendor.

But Big Oaf seated himself with assurance and said:

"What's your handle?"

It was no time for resistance. Pendrake gave his name quietly.

Big Oaf whirled in his chair, pointed with a thick hairy finger at a tall, gray-eyed man in a faded black suit.

"What kind of a handle is that, MacIntosh?"

The tall man shrugged. "English."

"Oh!" The pig eyes turned back to Pendrake, stared speculatively. The beast said: "Better talk fast, stranger."

It was the Western twang of speech that made it almost impossible for Pendrake to grasp that he was on trial. A psychological hurdle it was that he had to force his mind over. But finally, with gathering consciousness that he was talking for his life, Pendrake began his explanation. He finished with a rush, twisting on his heel and facing straight toward the thin-faced young man who had been his jailer, saying in a ringing voice:

"And Morrison, here, will bear out every word. He says I talked in my delirium about what I'd been through. Isn't that right, Morrison?"

Pendrake stared at the young man's face and felt a brief, icy sardonicism at the petrified expression that was there. Morrison's eyes grew wide, and then Morrison was gulping:

"Yup, that's right, Big Oaf. You 'member you told me to listen, and that's what he said. He—"

"Shurrup!" said Big Oaf; and Morrison collapsed into silence like a pricked balloon.

To Pendrake came a brief compassion for the frightened young man, but there was no regret at all that he had put pressure on the little coward. He saw that the monster was studying him intently; and there was something in the expression— Pendrake forgot Morrison as Big Oaf said in a strangely gentle voice:

"Hit him a little, guys; I like to see how a feller takes punishment."

After a minute he said: "All right, that'll do."

Pendrake climbed groggily to his feet; and it wasn't all acting. In the excitement of the—trial—he had forgotten that he was a sick man. He stood shakily, and heard the beast man say:

"Well, fellers, what'll we do with him?"

"Kill him!" It was a raucous cry from several throats. "Throw him to the devil-beast. We ain't had a show for a long time."

"That ain't no reason to kill anybody," said a thick-faced man in the back of the crowd. "If these fellers had their way, they'd have a show every week, and we'd all be dead soon."

"Yah, Chris Devlin," a man snarled, "and that's just where you'll be one of these days."

"Just start something!" Devlin snapped back. "We're waitin' for ya."

"That'll do!" It was Big Oaf. "The stranger lives. You can stay with Morrison for a while. And listen, Pendrake, I wanna talk to you after you've had another sleep. Hear that, you guys, let him in when he comes. Now, beat it, all of you."

Pendrake was ouside the stockade almost before he realized that he had been granted life.

VI.

Pendrake ate and slept, then ate and slept again. He awakened from his third sleep with the thought wedged tight in his mind that he dared not delay any longer his visit to Big Oaf.

But he lay for a few minutes. It was not that his bedroom was particularly comfortable. The sparkling light from the walls was too sustained for human eyes that needed darkness. The bed, while soft, was concave. So were the two long backless chairs. The door that led to the adjoining room was two feet high, like an igloo entrance.

There was a scraping sound, a head poked through the doorway, and a stocky man crawled through and stood up. It took a moment for Pendrake to recognize Chris Devlin, the fellow who had objected to his being killed.

Devlin said: "I'm being watched. So my coming here puts you under suspicion."

"Good!" said Pendrake.

"Eh!" The man stared at him; and Pendrake returned his gaze coolly. Devlin went on slowly: "You've been thinking things over, I see!"

"Plenty," said Pendrake.

Devlin seated himself in one of the concave chairs. "Say-y-y," he said, "you're a man after my own heart. I'd like to ask you a question: The way you handled Troger—was that an accident?"

"I could do that," said Pendrake flatly, "to Big Oaf."

He saw that Devlin was impressed and smiled wryly at the effectiveness of the psychology he had used—the psychology of deliberate positivity.

"It's too bad," said Devlin, "that a man with your spirit has only got one arm."

Pendrake winced. The problem of his one arm was not one which he had omitted in his calculations. He said quickly:

"Forget my lost arm. It's no handicap. The important thing is, how many men can you count on?"

"About a hundred. Two hundred more would shift over if they dared, but they'll wait till the tide has turned. That leaves two hundred solidly against us, and they can probably dragoon another hundred into fighting for them."

"A hundred is enough," said Pendrake. "The world is run by small groups of men. Two hundred thousand determined men overthrew the Czarist regime in a Russia of a hundred and fifty million people. Hitler took control of Germany with a comparatively small body of active followers. But here's some advice, Devlin."

"Yes."

"Take the water source. Take the places that are guarded, and hold them at all costs. Kill every one of the two hundred who are solidly for Big Oaf, even if they beg for mercy. On Earth we have the Shaposhenko punishment for their kind with its careful gradations, but that's impossible here." Pendrake paused, then: "How many wives have you got, Devlin?"

The man started, changed color. He said at last, violently: "We'd better leave the women out of this, Pendrake. Our men have been so long without women that—we'd lose all our followers."

"How many wives?" said Pendrake steadily.

Devlin stared at him. He was pale now, his voice harsher. "Big Oaf's been clever," he admitted. "When we captured those German women he gave every one of his hundred most determined enemies two wives."

"Tell your men," said Pendrake, "to choose the one they prefer, and leave the other alone. Do you understand?"

Devlin was on his feet. "Pendrake," he said in a thick voice, "I'm warning you, leave this subject be. It's dynamite."

"You fool!" Pendrake snapped at him. "Don't you see that you've got to start right? The human mind it a deadly instrument that gets into certain habits. If the habits are wrong—and the very idea of two wives makes chattel out of women and its therefore utterly wrong—I repeat, if the habits are wrong you can't just start refashioning the mind. You've got to break *that* matrix by death and begin with a fresh one."

He broke off: "Besides, you people haven't any choice. You're all slated to be killed, and those wives are designed to keep you quiet until the right opportunity occurs. You know that, don't you?"

Devlin nodded reluctantly. "I guess you're right."

"You bet I'm right," said Pendrake coldly. "And I might as well make my position clear: Either this game is played my way, or it's played without me"—he stood up with a swift, gliding movement, his voice grim as he finished—"and I pity those who tackle Big Oaf without this arm of mine to hold him off. Well, what do you say?"

Devlin was standing frowning at the floor. At last he looked up, a wan smile on his face.

"You win, Pendrake. I don't

promise results, but I'll do my derndest. Our boys are good fellers at heart—and at least they'll know they're dealing with a right guy. But now you'd better be on your way to Big Oaf. Yell loud if he starts anything."

"Any idea," asked Pendrake, "what he wants me for?"

"Nary a one," was the reply; and Pendrake was halfway to the stockade before it occurred to him that he still didn't know how, these old West men had gotten to the Moon, and that he had forgotten to ask Devlin if the cave dwellers had had the wit to make plans to protect themselves from German retaliation for their depredations.

So quickly had he become absorbed by the immediate danger, and forgetful of the greater, more remote one.

Big Oaf crawled out of the door of his house, and stood up.

"You took your time," he growled.

"I'm a sick man," Pendrake explained, "and this Moon gravity makes it possible to walk where you'd be flat on your back on Earth. That beating your men handed me didn't help any, either."

The monster's answer was a grunt, and Pendrake stared at him cautiously. They were alone inside the stockade; and the effect was of isolation from the universe, a curious, empty feeling of being cut off in an unnatural world.

He saw with a start that the creature's piglike eyes were studying him. Big Oaf broke the silence:

"I been here a long time, Pendrake, a long time. I was kinda dumb when I first came—like these other guys are; but my brain somehow grew up over the years, and now I got the sense to worry about things they never even think about, like those Germans f'r instance."

He paused, and looked at Pendrake. Pendrake hesitated, said finally:

"You'd better worry about them, and worry hard."

Big Oaf waved an apelike arm, and shrugged his massive shoulders. "I merely mentioned that as a f'r instance. I got my plans laid for those fellers. What I mean is, when you look at me, think of somebody who's got a brain with sense in it like your own, and never mind the body. How about it, uh?"

Pendrake blinked. The appeal was so unexpected, so remarkable in the picture it brought of a sensitive mind aware of its beastlike body, that he was touched in spite of himself. Then he remembered the five wives, and the two other women who had killed themselves. He said slowly:

"What other worries have you got, Big Oaf?"

It seemed to him, as he spoke the noncommittal words that the barest hint of disappointment flickered over the hairy face. Then Big Oaf said:

"I was walkin' along a trail on Earth, 'n' all of a sudden I was here."

"What's that!" Pendrake gasped.

Incredulous, his mind hurtled back over the ape man's words, and again the shock came. It took him a long moment to grasp coherently that he had been told the secret of how these people had arrived on the Moon. Big Oaf was continuing:

"It was the same with the others. 'N' from the way they describe it, they were coming down the same trail—that scares me, Pendrake."

Pendrake frowned. "What do you mean?"

"There's something down there on Earth, nothing you can see, but at this end you come out of a machine. Pendrake, we gotta shut that machine off somehow. We can't live here, not knowing who or what's gonna barge along that trail and through the machine."

"I see what you mean," said Pendrake slowly.

It was the calmness of his own words that shocked him this time. For he was quivering in every nerve, his whole body cold, then hot, then cold again. A machine—

A machine that transported objects unharmed—focused on a trail in the western United States, a machine through which an army could come and attack the Nazi strongholds on the Moon, capture an engine, everything—

With a start, Pendrake saw that the Neanderthal was glaring at him. The man had been sitting against the edge of the wooden platform on which the throne chair stood; now he leaned forward; the great muscles of his chest stood out like anchor ropes.

"Stranger," he said, and he almost hissed the words, "get this straight, this place is fenced-in territory. There ain't never a lot of people gonna come down here. The world'd go mad if it was ever found out that there was a town in the Moon where its possible to live forever. Now, do you see why we've got to shut off that machine, and cut ourselves off from the outside? We got somethin' down here that people'd commit murder to have.

"Wait"—his voice beat at Pendrake—"I'm gonna show you what happens to guys who get any other kind of idea. Come along."

Pendrake came. Big Oaf ran along the street straight into the open country, and Pendrake, bounding along behind, saw after a moment where he was heading: the cliff.

Big Oaf reached it first. He pointed down. "Look!" he cried hoarsely.

Pendrake approached the edge of the abyss cautiously, and peered over. He found himself staring down a wall of cliff that descended smooth and straight for a distance of about five hundred feet. There was brush at the bottom and a grassy plain and—

Pendrake gasped. Then he felt faint. He swayed dizzily—and then with a terrible effort caught his whirling mind. And looked again, trembling.

The yellow-green-blue-red beast in the pit was sitting on its haunches. It looked as big as a horse. Its head was tilted, its baleful eyes glaring up at the two men. And the hideously long teeth that protruded from its jowls confirmed Pendrake's first mind-shaking comprehension:

The devil-beast was a sabre-toothed tiger.

Slowly, his breathing returned to normal, his pounding heart slowed. The great wonder came:

How many æons that machine must have been focused on that trail there on Earth, to have caught such a prehistoric monster. And how tremendously long ago the people who had built the machine and the village must have died.

The thought passed. With narrowed eyes he stared at Big Oaf. The creature-man was kneeling at the abyss edge a dozen feet away, watching him intently. Pendrake said softly:

"It must have been fed. It must have been kept alive on purpose."

Blue-gray eyes that were slate-hard, met his own. "At first," said Big Oaf, "I kept it alive for company. I used to sit on the cliff and shout at it. Then when the blue men came with a bunch of buffalo, I got the idea that maybe it would come in handy. It knows me now."

He finished darkly: "There's plenty of men inside it, and there'll be more. Better not be one of 'em, Pendrake."

Pendrake said steadily, slowly: "I'm beginning to see the light. All this attention you're lavishing on me—you said something about shutting off the machine—and I'm the only man who ever came here who knows anything about machinery. Am I getting warm, Big Oaf?"

Big Oaf climbed to his feet; and Pendrake did the same. They backed away from the cliff's edge step by step, staring at each other. It was Big Oaf who said finally:

"Pendrake, I'm gonna offer you half of everything. You and me'll be the bosses here, with first choice of the women and all the good things. You know we can't let the world in on this place. It just ain't possible. We'll live here forever, and maybe if you ever get all the machines on this place workin', we can step out and get what we want from anywhere."

"Heil Hitler," said Pendrake sardonically. "Big Oaf, have you ever heard of an election?"

"Uh!" The pig eyes stared at him suspiciously. "What's that?"

Pendrake explained; and the hairy beast gaped at him incredulously.

"You mean," he exploded, "if those lame brains don't like the way I run things they could kick me out?"

"That's it," said Pendrake. "And it's the only way I'll play ball."

"To hell with that," was the snarling response. And on the way back to the town Big Oaf said in an ugly tone: "Somebody told me you've been talkin' to Devlin, Pendrake. You—"

He broke off. The anger died from him as if he had cut it out with a surgical knife, cleanly. As

Pendrake watched the transformation in narrow-eyed astonishment, a grin spread over the apish face:

"Just lissen to me gettin' mad," Big Oaf said, "a feller that's lived a million years and is gonna live another million if he plays his cards straight."

Pendrake was silent, conscious of the man eying him. He was startled, too, thoughtful. In every way Big Oaf was showing himself to be an immensely dangerous "feller."

"I got all the aces, Pendrake," Big Oaf's voice projected softly across his brief reverie, "and a royal flush up my sleeve. I can't get killed 'less a rock falls down from the roof—" He glanced up toward the height above, then looked at Pendrake, his grin broader. "It happened onct to a guy."

They had stopped. They stood in a little valley under a spread of trees. The town was beyond the rim of the hill. But for the moment there was not a sound of raucous laughter, not a whisper of voices. They were alone in a queer universe, man and semiman facing each other. Pendrake broke the thrall:

"I'm not going to count on it happening to you."

Big Oaf guffawed. "Now you're smart. I thought you'd catch on quick. Lissen, Pendrake, you can't buck me, so think over what I've told you. Meantime, I want your promise you won't mix up with anybody. Is that fair?"

"Absolutely," said Pendrake.

He felt no compunction about the swift promise. It was clear that he had gone to the very edge of the abyss in his opposition; and he wasn't ready. If there was one thing the years of fighting had taught every sane human being on Earth, it was that death came easily to those who fought fair against those who didn't. Big Oaf was continuing:

"Maybe we could even work together on a couple of things, like those Germans. Maybe I'd even let you look that machine over after the next sleep. Say-y-y—"

"Yes?" Pendrake stared at him warily.

"Didn't you tell me your wife was a prisoner of the Germans. How'd you like to spend a coupla weeks leadin' an expedition to see if you could rescue her?"

Pendrake's brain thrummed. It became a pain that extended down into his body, and then he saw that the other's small, shrewd eyes were contemplating him sharply.

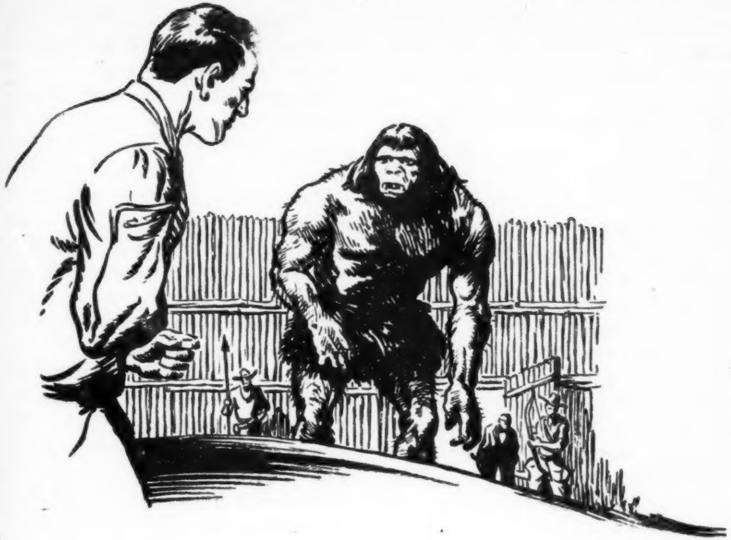
Excitement puffed out of him. Eleanor had to be rescued *fast*—but he couldn't see himself bringing her down here until he had consolidated his position with Devlin and the others. Couldn't see himself at all on an expedition of which the large purpose would be mass woman stealing.

Compromise plus his own desperate necessity was going to make for complication.

VII.

"It's time to get up!"

Morrison came into the bedroom



the next morning with the announcement.

"Time?" Pendrake stared at the slim young fellow. "Isn't all time down here the same? Why shouldn't I just stay here until I get hungry?"

To his surprise, Morrison shook his head doggedly. "You've been sick, but that's over. Now, you've got to fit into the routine. Big Oaf says so."

Pendrake studied the other's lean face. The thought that was in his mind had to do with Morrison as a spy on his activities. It hadn't really struck him before how much of a Big Oaf follower the clerk-ish little fellow was.

His plan to spend the next few days in an intensive sizing up of everything and everybody in this strange land might as well begin here and now. Not that Morrison was dangerous as an individual. The man would always be a supporter of the regime that was *in*.

"Big Oaf," said Morrison, "has got everything organized. Twelve hours for sleep, four hours for eating and so on—you don't have to eat or sleep of course. You can do anything you want so long as you're ready to do your eight hours a day work."

"Work?"

Morrison explained: "There's guard duty; the cows have to be milked twice a day. Then there's the gardens to look after, and we kill several steers a week. It's all work."

He pointed with a sweep of his arm, vaguely. "The gardens are over there beyond some trees, in the opposite direction from the pit where the beast is."

He finished: "Big Oaf wants to know what you can do."

Pendrake smiled wryly. So the apeman was letting him know what life would be like if he was not one of the bosses.

It wasn't the work but the sudden vivid picture of the tight system of a law-and-order hierarchy behind it, that was unsettling. Pendrake frowned, said finally:

"Tell Big Oaf that I can milk cows, work in gardens, do guard duty and a couple of other things."

But there were no work orders for him that day. Or the next. He wandered around the town. Some of the men rebuffed his approaches, others were so uneasy that talking to them was a hopeless chore, still others including men who were stanch supporters of Big Oaf were curious about Earth. Some of these had the idea that he was going to be one of them.

In the course of the conversations, Pendrake learned the case histories of miners, gamblers, cowboys. His composite picture grew clearer. The main group of them belonged to a period between 1825 and 1875. He placed the trail where the transport machine was focused to be within twenty miles of an old frontier settlement called Canyon Town.

On the third morning Devlin crawled into Pendrake's bedroom just as he was getting up.

"I noticed Morrison going to the stockade," the man said, "so I sneaked over. We're ready, Pendrake."

Pendrake jumped a little, and then settled down onto the bed. He sat there grimly wondering what these men with their complete inexperience of a really planned war considered adequate readiness. He listened, trying to picture everything in scenes, as Devlin began:

"The central idea is to take the stockade and force surrender. The men don't fancy a lot of bloodshed. The details are—"

Pendrake listened to the childish thing, conscious of a great weariness. All his advice had been ignored. The ruthless surprise attack that alone would make for a quick victory, bloodless for the attacker, shelved for a vague scheme to get the enemy cornered in the stockade and—

"Listen, Devlin," he said finally, "look at me. For two days I've been doing nothing. You'd think I didn't have a care in the world. Yet my wife's in the hands of the damnedest, most murderous bunch of gangsters that ever lived on Earth. My country is in a danger that it doesn't even know about.

"Furthermore, three days ago, Big Oaf asked me if I'd like to lead an attack against the Germans on the chance that they have my wife here on the Moon. It's obvious also that such an attack might enable us to capture an atomic engine.

"Why am I not rushing forward when I'm nearly crazy with anxiety? Because defeat is ten times as easy as victory and more final. Because all the will in the world isn't enough if the strategy is bungled. As for bloodshed—you don't seem to realize you're dealing with a man who won't hesitate a second to order a general massacre if his position is ever threatened.

"You don't seem to realize how skillfully this place is organized. The outward appearance is deceptive. Unless you work fast, you'll have all the doubtful men against you, and they'll fight twice as hard to prove to Big Oaf that they were with him all the time.

"Now, let's organize for battle, not a game. Tell me, what's in those guarded buildings?"

"Guns in one of them, spears and bows and arrows in another, tools in a third—everything that ever came through from Earth Big Oaf took possession of."

"Where's the ammunition for the guns?"

"Only Big Oaf knows— Say, I'm beginning to see what you mean. If he ever gets those guns going—we've got to capture them."

"If," said Pendrake, "the first arrow fired by every man could kill or disable one of them, our little war would be over in ten minutes, but —"

There was a scrambling sound at the doorway. Morrison crawled through. He was breathing hard, as if he had been running.

"Big Oaf," he gasped, "wants to show you the transport machine. Shall I tell him you're coming?"

The transport machine stood inside a high, timber stockade five feet from the edge of the cliff. It was made of a dark, almost a drab metal, and its base was a solid gray rock.

Pausing on the wooden platform that ran around the upper edge of the stockade, Pendrake frowned down at the unbeautiful structure. In spite of all his will, he was excited, because if he could get this marevlous instrument to work, if he could focus it *anywhere,* say into the German prison where Eleanor was, or into American military headquarters or—

Or simply learn how to reverse it!

Shakily, he forced the hope out of his mind. Thirty feet long, he estimated, twelve high and eighteen wide. Big enough for almost anything except a locomotive.

He walked along the platform, and paused finally where it twisted around the edge that overlooked the abyss. The distance that stretched below shocked him. His body did not succumb easily to dizziness, but it wasn't necessary to take the risk merely to get a down look at the mouth of the machine.

He drew back. He faced Big Oaf who had been sitting watching him with expressionless eyes.

"How do you get into the stockade?" Pendrake asked.

"There's a door at the other side."

There was. Padlocked. Big Oaf fumbled down into the fur that was strapped around his great belly, and produced a key. As the creature swung open the heavy door, Pendrake extended his hand.

"How about letting me have the lock? I don't think I could climb up those walls if I happened to get left inside."

He spoke deliberately. He had done a lot of thinking of what his face-to-face policy to Big Oaf should be; and it seemed even now in the speaking that open distrust expressed without rancor was psychologically correct.

Big Oaf grimaced. "That place ain't fer you. I built it strong and high like that so nobody nor nuthin' could come through from Earth and catch me by surprise."

"Nevertheless," Pendrake insisted, "I wouldn't be able to concentrate properly if I had even the feeling that maybe—"

Big Oaf grunted. "Look," he said, "maybe you'd like to lock me in."

Pendrake pointed. "See that hill over there, about a hundred yards?"

"Yaah?"

"Throw it over there?"

Big Oaf stared at him surlily, then he cursed. "Like hell! Suppose you got somebody over there to pick her up, and lock us both in? Then they put an arrow in me, and let you out."

In spite of his tenseness, Pendrake smiled. "You're one ahead of me," he confessed.

He frowned finally. It wasn't that he had any real fear of Big Oaf at this stage. The man didn't have to use trickery, not yet. And it might be a good idea, now that his protest had been made, to let the beast win. Not too fast, though.

"Ever leave anybody in there?" he asked.

The squat man hesitated. "Yaah," he said. "Two funny-lookin' guys all dressed up in metal. They had a damn queer gun, all kinds of fine wires on it, and the whole thing shining with a blue light.

"I used to have a scar on my shoulder where they burned me with it. I was scared stiff they'd burn down the stockade, but I guess it didn't work on wood."

He sighed hoarsely with regret. "I'd sure like to have had that gun. But they took it with 'em when they jumped over the cliff."

Big Oaf explained: "There's another door that opens onto the cliff side. I opened it fer 'em, when they went mad. All this," he finished, "was long ago, maybe half the time that I was here."

Human beings with heat guns and metal suits five hundred thousand years ago—locked up with the machine for weeks. He tried to picture them caught in this towering horror of a cage, with an ape thing looking down at them.

The picture grew so vivid that, for a moment, he could almost *see* the men staggering from thirst and hunger and insanity leaping down to the merciful death below.

The vastness of the elapsed time —and a crowding thought—abruptly dimmed the horrible vision. The interrupting thought grew enormous. He said at last, wearily:

"You must be a sap, Big Oaf. If men who could make and understand guns like that, couldn't make the machine reverse itself, how do you expect me to? In their deadly desperation, they must have tried everything."

"Huh!" said Big Oaf. Then he cursed his comprehension of the defeat that was here.

All Pendrake said was: "I'll have a look, anyway."

But there was nothing. The trouble was, the machine had no knobs or dials, or any levers. It lay hard on the rock, an expanse of smooth metal, with a deep indentation where it functioned.

The indentation was a regular cave. Pendrake walked in without much hope, and his pessimism was justified. The active wall was pierced with tens of thousands, *millions* of tiny, needle-sized holes.

He took out his lighter, and, holding the flickering flame in front of his master eye, tried to peer through the flame into one of the holes. Something glittered back at him. Shrugging, Pendrake came out of the chamber.

"The control room must be elsewhere," he said with decision. "In fact it has to be. There must be some kind of television control board from which they aim the machine."

He stood, studying the rock. "Or perhaps we ought to try our hand at drilling under the machine. Might be some connecting cables." He glanced up at Big Oaf. "You said something about other machines—"

He left the question hanging. A scowl was gathering on the beast man's hairy face. Big Oaf said curtly:

"You ain't seein' no other machines till we make a deal. And just in case you figger you got lots of time to lie around here gettin' all set with Devlin to knock me off my perch—that expedition is leavin' tomorrow for some more women.

"I wasn't gonna send it till t'other one got back, but I gotta hunch it's time we start pullin' down the caves between us and them Germans. You can go or not, any way it suits your play, but you better make up your mind fast. Now, come on, let's get back to town."

There was a tight silence between them as they walked. Pendrake's mind was seething. So Big Oaf was forcing issues, taking no chances.

He studied the waddling creature out of the corner of his eye, trying to read in the heavy, brutish countenance something of the purpose behind it. But impassivity was a norm of that facial structure. Only the implacable physical strength of the man stabbed forth in every movement, every writhing muscle.

Pendrake said finally: "How do you get up to the surface? There's no air or warmth up there, is there?"

He added before Big Oaf could speak: "What kind of quarters have the Germans made for themselves?"

A minute dragged. He thought:

"He's not going to answer." But abruptly the other grunted:

"It's the lighted passages that's warm and got air in 'em. A whole bunch of 'em got right to the surface, some of 'em hidden damn smart by doors that look like rock or dirt. That's how we fooled the Germans so far. We just rush out of a new door and—"

A shout cut off his words. A man burst over the near hill, and ran toward them. Pendrake recognized him as a Big Oaf hanger-on. The fellow came up breathing hard.

"They're back with women. The men are going wild."

"They'd better watch out!" Big Oaf growled. "They know what they'll get if they touch any of 'em before I see 'em."

There were about thirty women huddled, and the motley throng gathered around them; set up a wild yelling as Big Oaf arrived; lusting voices squealed with demand and counterdemand:

"I've only got one wife; I got a right to another." "It's my turn." "Big Oaf, you gotta." "I've earned—"

"Shurrup!"

The silence was instantaneous and deafening, and was broken finally by a bull-necked man who came up to Big Oaf and said:

"I guess that's the last woman rustlin' we do, boss. Those blankety-blank Germans were ready for us, and they seem to have explored all the cave approaches to their place. They followed us like a bunch of vigilantes, and we escaped only by knocking down that narrow cut-off at—"

"I know the one. How many dead?"

"Twenty-seven."

Big Oaf was silent for a moment, frowning, finally: "Well, let's get to the pickin'. I'm takin' one for myself and—"

"Jim!"

Pendrake had been listening grimly to the conversation. Now, he spun on his heel, and stared wildly at a lithely built young woman who was running toward him, crying as she ran. She flung herself into his infolding arm, and lay against him in a dead faint.

Over her limp, dark head, Pendrake gazed straight into Big Oaf's grinning face.

"Somebody you know?" the monster smirked.

"My wife!" Pendrake said; and there was a terrible sinking sensation in him. He found himself looking around for Devlin, but the man didn't seem to be in the crowd. "The Germans—"

He was vaguely aware as he talked that Big Oaf was looking beyond him. Now, suddenly, the hideous head nodded; simultaneously, a warning voice yelled:

"Watch out!"

Pendrake came to, his head aching, and stared dizzily up at the heavy, anxious face of Devlin.

"What happened?" he muttered; and then in a surge of returning consciousness: "Where is she?"

Devlin said: "He's just taken

her inside the stockade. Look, Pendrake, we're all ready to make the attack. Here's a knife—"

Pendrake grabbed it, and slipped it into his pocket. He said incisively: "Launch the attack when I've been inside the stockade about five minutes."

"But how are you going to get in?" Devlin gasped.

"Don't worry about that," Pendrake flung over his shoulder. To the guards he said: "Tell Big Oaf that I'm ready to talk business—"

Big Oaf came grinning out of his house. "I thought you'd see sense," he said—and then he grunted as the knife Pendrake threw buried itself seven inches in his great chest.

He tore the bloody thing out of his flesh, and grimacing, flung it to the ground.

"You get the pit for that," he said. "I'll just tie you up and—"

He came forward and—just like that—a chill raced up Pendrake's back. Monstrous head bent low, animal arms spread out, the abnormal strength of the man showed in all its hideous power. In a single flash of terrible realization, Pendrake's confidence collapsed before the mighty thought that—

No man born in the last hundred thousand years could begin to have the superhuman strength necessary to defeat this hairy, titanic beast.

VIII.

The whining winds of an early winter started to blow steadily in mid-September. On the thirtieth, snow fell; and nearly all New York State and Pennsylvania awoke on the morning of the first day of October to a world that was white and pure and peaceful.

That same day far, far to the south, Hoskins and Cree Lipton took off from the bulge of Brazil, and headed for Germany via Dakar, Algiers and Vichy.

The converted Hotel Adlon on Unter den Linden, Berlin, was a beehive of United Nations officers. In the great thick-carpeted Red Room on the second floor, the general officer commanding Occupation Forces showed them around:

"Now this," he said, "is what we call our murder map. And in view of the watch we've been keeping for you the past two weeks, this is an amazingly interesting document."

The map was thirty feet long and covered with colored pins—hardly a "document," Hoskins thought dryly. But he said nothing, simply watched and listened with an anxious will to hear the end result.

"Two weeks ago to the day," the general said, "we sent out the trucks all over what was formerly occupied Europe with the posters asking for information about the engine; the poster having been worded according to your cabled instructions."

He pulled out a package of cigarettes, offered them to the two men; Hoskins refused with a tiny inclination of his head, and waited impatiently while the others lit up. The officer went on:

"Now, before I tell you the extent and limitations of our success, I think it is necessary to describe briefly the situation that exists in Germany today. As you know, Hitler's method was to put a party man into every conceivable controlling position in every community.

"Naturally, we deposed all these petty fuehrers, replacing them with the stanchest pre-war democrats we could find. At this point we ran into a difficulty.

"The Nazis had anticipated us. In every district a secret Nazi cell had been built up with a secret leader under whose command were young, stone-hearted men specially trained to commit murder and to defeat all attempts to reconstitute democracy. The leaders we appointed hardly dare to make a move for fear of displeasing these hidden Nazi zone chiefs.

"It will straighten out in time, of course. As the Nazi youth go into their thirties, get married, their zest for danger will fade; and the new, younger generation is being trained our way.

"Nevertheless, political creeds like pretensions to thrones, die hard. And right now these people are committing about a thousand murders a week in Germany itself; about eight hundred more in the rest of Europe."

"How does this affect the finding of information about the engine and about the seven missing scientists whose bodies and whose families we couldn't find in the U. S. A.?" asked the heavy-jawed Lipton.

"We made a murder graph of every district in Europe," was the reply, "and as the appeal for information spread, watched day by day for any upswing in murders, the assumption being that great precautions would be taken by the Nazis in districts where information existed."

He faced the two men, a grim smile on his face.

"I report accordingly with mixed feelings, that the number of murders in two widely separated territories, one in Hohnstein in Saxony, the other in the town of Latzky, Bulgaria, increased out of all normal proportion."

"Bulgaria?" It was Lipton, his tone puzzled.

Hoskins said quickly: "After all, our closest watch has always been on Germany proper. They must have found it easier to set up interplanetary bases among certain sympathetic people."

The general looked at him from shrewd brown eyes.

"Exactly. We've made a very careful, cautious survey of those two districts. On the third day of our search we found a luxuriously furnished mine shaft at Hohnstein that evidently had been hastily abandoned.

"Questioning among townsmen," the officer went on, "elicited the information that a strange, zeppelin-like machine had been seen at night in the vicinity of the abandoned shaft."

"Good Heaven!"

Hoskins was scarcely aware that he had uttered the exclamation. He realized after a blank moment that he had been listening to the general with a vague impatience, and anxiety to have an end of words and to get actively on with the search. And now—

It was all done. The search was over; or almost over. All preliminaries were successfully concluded.

"Sir," he said warmly, "you are a remarkable man."

"Let me finish," the officer smiled broadly. "I'm not through yet."

He went on in a precise tone: "We have received altogether three —out of thousands—letters that are unmistakably genuine and relevant. The third, and most important, from a Frau Kreigmeier, wife of the man who has been Nazi party leader in Latzky for three years, arrived last night when I had already received word that you were on your way.

"Gentlemen"—his voice was quiet but confident—"by the end of the week you will have all the information that is still available on this continent.

"Naturally," he finished, and his careful phrasing of his promise had already brought the first shock to Hoskins, "the Nazis will have made every effort to insure that nothing vital is available. Nevertheless—"

By noon of October 4th they had the bodies. Seven older men, nine women, two girls and twelve youths lay side by side on the cold ground. Silently, they were loaded onto a line of hearses, and started on the journey to the coast from whence they would be shipped to America for more fitting burial.

After the hearses had disappeared down the road, Hoskins stood with the others in the little clump of bushes where they had been led by the plump husband of Frau Kreigmeier. A cold north wind was blowing, and the men in the armored cars that had escorted them were beating their hands together for warmth.

In spite of the cold, Hoskins noted ferociously, Herr Kreigmeier was sweating profusely. "If ever a man deserved the Shaposhenko punishment—" he thought.

But they had promised; the posters had promised—money, safe removal to any second-degree United Nations Mandate, and unlimited police protection.

The general came up: "The shovel men will finish up here," he said. "Let's go. I crave the warmth of a hotel room. You can mull over the successes and"—he looked quickly at Hoskins—"the failures."

There wasn't much. Silently, Hoskins sat in his chair before a roaring grate fire, and reread the translation of the single note they had resurrected:

> Movement of anything requires a reverse movement, a cancellation, a balancing. A body moving between two points in space uses energy, which is another word for—reverse movement.
>
> The science of reverse movement involves in its greatest functions a relationship between the microscomos and the macrocosmos, between the infinitely small and the infinitely large. When a balance is established between two forces *of* the macrocosmos, one loses what the other

gains. Engines puff noisily, organic creatures laboriously perform their duties. Life seems infinitely hard.

However, when a reverse movement is created in the microscomos for a movement occurring in the macrocosmos, then the ultimate in energy relations is obtained. There is also a complete balancing result; the law that movement is equal to reverse movement holds as rigidly as before—

"I'd hate," said Hoskins wearily, "to ask any patent office to grant a patent on that. I'm afraid we've reached the end of the engine trail; and that means my hope for quick action that would rescue Pendrake and his wife is gone. The rest of this stuff"—he flicked the typewritten sheets—"consists of notes on elementary radium reactions. There's a big gap somewhere, and I guess it's the hole in the empty sack we're holding."

He looked up. "Anything new from Hohnstein, Saxony, the other murder center?"

"Nothing," said Cree Lipton. "It was obviously only one of their ports of call for spaceships, hastily evacuated during our search. They've got their main equipment, all their secrets, on Mars or Venus—"

Hoskins cut in: "The Moon! Make no mistake about it. Mars and Venus are too far away even at their closest. And besides, they wouldn't dare let their young men and women see the kind of planet that Venus must be if you can believe the report of what the Lambton Land Project promised its settlers. It's blood and iron the leaders who escaped the Shaposhenko punishment have in mind for their Herrenvolk, and so they'll keep them going on a diet of hard work and hard environment.

"Furthermore, they've only had eight months, and they can't have the quantity production necessary to cover longer routes.

"We'll have to locate all the supply centers like the ones at Hohnstein and Latzky, and force them to mine their own material with their limited means. Then when we attack—"

"When we *what?*"

Hoskins smiled savagely at Lipton's amazement, said with a blazing steadiness: "You don't think, Lipton, that just because we can't duplicate the engine they've stolen, that we're going to sit helplessly down here while they gather their strength on the Moon?"

"But what—"

"The idea came to me last night," Hoskins said, "and I could have kicked myself for not thinking of it before. You see, Lipton, space was actually conquered many years ago. Only we were blind fools."

The knob-jawed giant was on his feet, staring at him. "You're crazy!" he shouted.

Two quick strides brought him looming over the slighter man. "Quick," he said hoarsely, "what is it? Don't keep me here sweating."

As Hoskins told him quietly, the big man's jaw began to sag. He stood finally, a stunned look on his face. His voice was a whisper as he said:

"You've got it. Oh, man, you've

got it!" He started for the door. "Let's go—back to Washington. There's no time to waste."

IX.

Pendrake backed, warily now. His first horror of the muscled colossus that was lumbering toward him was past. But the conviction that he must wait a favorable opening was an ugly surging along his nerves, a high, sustained thrill unlike anything he had ever known.

Unashamed of his reluctance, yet desperate in the need for haste, he waited the attack that Devlin and his men were to launch—anything that would distract the beast's attention.

When the attack came, with an abrupt roaring of men's voices, Pendrake flung himself forward, straight at the hairy man.

A bearlike arm reached out to grab him. He knocked it aside with one thrust of his hand and for a fleeting second had his opportunity.

The blow against that massive jaw nearly broke his fist. Even then all would have been well if the smash had accomplished its purpose.

It didn't. The monster did not as much as stagger; and instead of standing stunned for that instant of leeway that Pendrake had counted on to get away, Big Oaf plunged forward. His cable-thick arms closed like the jaws of a steam shovel.

The Neanderthal bellowed with triumph: "Gotcha!"

As the creature started his terrible squeeze, Pendrake jerked free his imprisoned arm, jabbed his fingers at Big Oaf's pig eyes, shoved hard—and tore his body from that deadly embrace.

It was his turn to cry out with the wild glee of a man in the full grip of battle lust: "You're licked, Big Oaf! You're through. You—"

With a hoarse cry, the hairy man leaped toward him. Laughing harshly, Pendrake danced back and—

Too late, he noticed the throne platform directly behind. His retreat, made easy by the Moon's gravity, was too swift for sudden halt. With a crash he fell flat on his back onto the platform.

It was over as swiftly as that. On his feet he could have won; in that one test of strength he had lost all doubt of that. But with Big Oaf kneeling on top of him, striking at him with body-breaking fists—in a minute Pendrake was clinging to his senses by the barest thread of consciousness. He was only dimly aware of being roughly and abruptly tied.

Slowly, his mind crept further out of the darkness, into fuller comprehension of the disaster that had befallen him. He said finally, thickly:

"You fool! Do you hear that fighting out there? It means you're through, no matter what you do to me. Better make a deal, Big Oaf, while there's still a chance.

One look into those creature eyes brought the sick knowledge that he had flung his tiny stone of hope

into a shadowed world. All the beast in the man was to the fore. The enormous lips were drawn back; teeth protruded like fangs; Big Oaf snarled with little grunts of indescribable fury; he blazed finally with a guttural hoarseness:

"I'll just bar the gate from this side. That'll make my men fight harder 'cause they won't be able to retreat in here. And it'll make sure that you and me have our little show all to ourselves."

He lumbered massively out of Pendrake's line of vision. There was the sound of timber crashing into position. Then the hairy thing came into sight again, grinning now. But when he spoke it was like a carnivore spitting rage:

"I'm gonna live here a million years, Pendrake, 'n' all that time your wife's gonna be one of my women."

Pendrake gritted: "You mad idiot, even if you win now, you'll die fast enough when the Germans come. And don't think they won't, either. You're just a bunch of bandits to them, a nuisance that they won't put up with for very long."

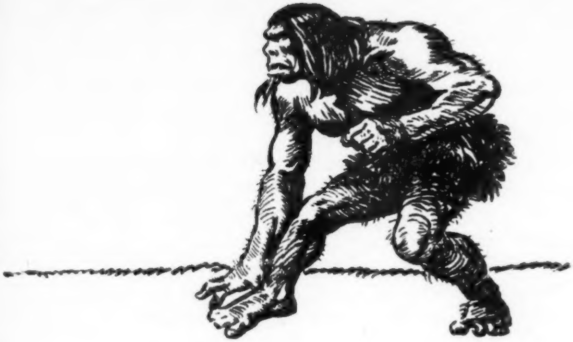
The words seemed not to touch the mind of the other. The man was, astonishingly, tugging at the throne platform. Pendrake watched, puzzled, as Big Oaf strained with all his enormous strength at the wooden thing.

Abruptly, the structure lifted. It came up; and reeled over with a crash as Big Oaf flung it away from him. Where its timbered sides had been lay the entrance to a cave.

"Those fools," Big Oaf said, with a withering contempt, "thought I had this platform here, and this stockade, because I wanted to play king. The blue men know the truth, but they won't learn any language but their own, so they can't tell even if they want to, which they don't."

He was bending over Pendrake as he finished. With a grunt, he heaved him to his shoulder, and jumped down into the lighted cave.

It was a twenty-foot drop. At the



bottom, he tossed his prisoner unceremoniously to the cave floor, and climbed back to the surface.

"Don't get anxious," he called back mockingly, "I'm just gonna let the platform down into place."

He landed with a thud a minute later, and picked Pendrake up again. "This cave," he said then, grinning, "leads straight to the pit. I'm gonna lower you down to my ole pal, the devil beast, and watch the fun.

"It'll be some fun, feller, uh!"

The cave sloped gently downward, and presently began to widen. It opened abruptly into a vast room filled with metal shapes.

Machines! They shone in the reflected light of the cave walls and ceilings. They stood there, silent, secret witnesses to the glory of a people who had attained—not quite immortality, for they were dead—but a measure of greatness probably unequaled in the Solar System before or since and—

"You could have had those machines to find out how they worked," Big Oaf taunted, "and you could have had your wife. But now I'll wait until some other guy comes along who knows about machines, and ain't so fussy.

"Maybe I'll give your wife to him, too," he added as an afterthought, and bellowed with laughter.

Pendrake remained silent. They were out of the machine room now; once more the cave was narrowing. But he scarcely noticed those facts.

His mind was rocking back and forth like a swing swaying higher and more wildly with each surge. And every minute the load on that careening brain grew heavier. There was the engine, the unsuspecting Earth, Eleanor—

The thought ended as if it had been cut out of his brain with a knife. The blood drained from his cheeks. The muscles of his solar plexus drew so tight that it was like an acute appendix pain for—he saw the end of the cave.

A moment later Big Oaf trumpeted: "Here we are!"

He tossed Pendrake to the floor and stood over him, smirking down at him; there was no doubt at all that he was in the throes of sadistic joy.

"This opening over the pit," he grinned, catlike, "is nearly three hundred feet farther down than the surface, and about a quarter of a mile from where I showed you the devil beast. The only guys who've ever seen this cave are the ones that came too fast out of the machine from Earth.

"You saw," he confided gloatingly, "the way the machine's only a few feet from the edge of the cliff. There was a time when everything that came through ran right over the edge. I was just walkin', so I was able to jump back, but the devil beast and a lot of the animals it lived on until I came must have been *runnin'* down that trail on Earth.

"After I built the corral, and saved all the deer and buffalo and cattle that came through, I fed the beast the leavings; always I fed it myself, until now it knows my call. Lissen!"

He stepped abruptly to the cliff's edge, ten feet away, and uttered a low, piercing cry. For a long moment, then, he stood staring down, facing away from Pendrake, stood crouching, slightly bow-legged, a squat, hairy, inhuman shape, a man thing spawned at the dawn of prehistory, a creature out of a hideous, an impossible dream.

But—*facing away!* Shaking in every nerve, shedding tiny rivers of perspiration, Pendrake slid forward on his back. His wrist was tied to one ankle, but his other leg was free.

Free to kick, free to—

Big Oaf turned. "He's comin'," he said. He seemed not to notice the strained body, the strained expression of his captive. He said in a matter-of-fact tone that was more terrible than all the passion and fury that had gone before:

"I'm gonna let you slide down on a rope, untyin' the bonds around your wrist just before I lower you over the edge. That way you'll be able to do a little runnin' when you get down. The beast likes that; it gives him exercise."

There was a rope neatly coiled at one side of the cave. As he picked it up and tossed one end over the abyss, Big Oaf explained precisely:

"I keep this here handy. You ain't the first, you know, who's gone over secret like this. Notice how one end's tied to a fence post."

He waddled over to Pendrake, knelt beside him and started to untie the cord that bound him.

"Funny," he philosophized, "the kind of stuff the men have brought with 'em from Earth: Rope, a wagon load of tools, rifles, revolvers —I got 'em all. Some of it, mostly ammunition, is hidden in this cave, and the rest in other caves they don't know about that I closed up.

"I'm gonna use those guns if Devlin wins. It don't take long to kill a hundred men from ambush if you've got bullets.

"You see," he finished with a grin, "I've got it all figgered. It—"

On Earth it wouldn't have worked. A three-hundred-pound body not quite in position for a good shove would have staggered back a couple of feet, then regained balance.

The Moon was different. The body weighed only fifty pounds, and the leg that shoved it strove desperately to act with all the force of a stick of exploding dynamite.

Big Oaf stumbled back, fighting for balance. If there had been one more step behind him, he might have made it.

But that step he took into the abyss.

It took minutes to wriggle out of the half-untied but clinging bonds. And then there was another more timeless period while the blood tingled back into the numbed members and while he lay almost sick with reaction.

Finally, with a desperate will, Pendrake scrambled to the edge of the cliff and looked down.

Big Oaf was just getting to his feet on the grass below, and the sabre-toother tiger was circling him.

"Hitler!" The cry rang out over the valley. "Hitler, how does it feel?"

Pendrake thought: "Did I shout that?"

His mind must have been turned by those minutes on the cliff's edge. Because even now that he recognized that it had been his voice, no shame came, nothing but a sense of the utter rightness of every mad syllable.

It fitted. How it fitted!

"Big Oaf," he screamed, "have you ever heard of the Shaposhenko punishment? There's an article in the beginning of it that says: '—he who evokes the Beast in Man, and feeds the Beast with cunning purpose, let him suffer from the Beast according to his measure. Let—' "

Pendrake stopped. Then he stared. Below him, Big Oaf was on his feet, backing away from the tiger. That was normal enough.

It was the saber tooth that was unnormal. The great animal was whining in unmistakable puzzlement *—and backing away from the hairy man!*

Backing away— It couldn't be fear. Nothing alive on Earth in the last ten million years could have brought one tremor of fear to that savage heart.

Big Oaf was shaking his head like a stunned ox; and Pendrake's attention concentrated on the man, and forgot the devil beast, even as the animal darted out of sight.

He saw that the Neanderthal was heading for the rope that hung down from the cave.

With a gasp, he snatched the rope out of his reach, thinking for the first time: "He fell seventy yards, and lived. That would be about forty feet on Earth. Could be—"

"Pendrake!"

The squat body was directly below. The unsightly head glanced fearfully toward where the tiger had disappeared; then:

"Pendrake, it recognized me as its feeder, but it'll be back. Pendrake, let that rope down."

Pendrake felt no mercy. His body was as cold as ice itself with the freezing thoughts that were in his mind. His whole being throbbed with the bleak yet utterly intense words that poured from his lips:

"Go to all the hells you've ever sent other men to. Go and lie in the belly of the beast you've nurtured with the blood of your victims. May the god who made you have pity on you; I have none."

"I'll promise anything!"

His rage lessened not, but grew. A picture came of the women who must have shuddered at the very sight, let alone the touch of the monstrosity that was now pleading with a human voice for a quality of mercy it had never shown to anyone. He thought of Eleanor—

And his heart steeled; his mind chilled to a new depth of deadly will.

"Promises," he mocked; and his laughter rang out demoniacally over that ancient valley of the long dead Moon. "Now we're back to Hitler, when he finally started to run: all the promises, the compromises, the deals he offered—and he never understood how hopeless it was. He—"

There was a flicker of yellow-red-blue-green in the brush a hundred yards to the right. A moment before, Pendrake had longed for the return of the mighty killer. But now—revulsion came swift to emotions that had been plucked raw.

Horror flashed in waves along his nerves. "I'm mad," he thought. "One man can't administer justice. Letting another human being go to a death like this. After all, it *wasn't* a true parallel. It—"

Frantically, he began to lower the rope. "Quick," he cried, "we can talk when you're out of reach of—"

The rope sagged with weight. Glassily, Pendrake watched the desperate man in his fight for life, watched the tiger.

The animal paced wildly up and down in an obvious fever of excitement. It kept looking up with eyes of yellow fire, roaring uneasily, and with an unmistakable gathering awareness of escaping food. Suddenly, whatever tie had held it back, whatever tie of fantastically ancient companionship had bound it to the man, snapped.

It ran back, then turned toward the cliff again, and became a streak of blazing color against the gray-brown walls. A hundred, a hundred and fifty, a hundred and eighty feet it raced up that perpendicular wall. And had its prey. The two bodies went down with a crash.

After a minute, the squealing died. There was a crunching of bones and a slavering sound so horrible that Pendrake drew back nauseated.

And then someone was yelling:

"Pendrake! We heard your voice. Pendrake, where are you?

The Germans are coming. Pendrake—"

X.

The winter clung. The snow seemed determined to stay forever. When it finally dissipated, the new glistening all plastic Interplanetary Building was opened with a triumphant fanfare; and the great appointment had already come to Hoskins: Commissioner—Chairman—

"It is absolutely unfair," he said to Cree Lipton, "that I should have this. There are a hundred men who laid the groundwork and fought in obscurity. Frankly, I accepted only when I heard that the notorious ex-Governor Cartwright, who was defeated in the last elections, was gunning for the job as a sort of pension for services rendered to the party—"

"I wouldn't worry about it," Lipton said. "You can help those chaps more than they could ever help themselves. By the way, did you see the announcement about Venus? Recognition for the Lambton colony there as a United Nations first-degree Mandate, with Venusian citizenship already given a special first-class status. Professor Grayson and the other scientists and their families didn't die in vain."

Hoskins nodded. "It's a great victory, but the danger of important inventions held secret by well-meaning individuals being stolen and misused—"

He was interrupted: "Listen, Ned, what I really came to see you about—put on your hat, come with me."

Hoskins shook his head, smiling. "Can't be did, old man. The reports from our successful expedition to the Moon are just reaching the flood stage. There's one really curious item—"

He took a folder from a drawer, and flipped over several pages of foolscap. " 'The Nazi prisoners claim,' " he read, " 'that they were captured easily because their military forces had for months been engaged in digging along collapsed tunnels trying to root out some creatures who live inside the Moon. They claim that these beings are human. Our own investigations have found only caves that sooner or later come to a dead end—' "

He saw that Lipton was looking at his watch. The F. B. I. agent caught his glance, and apologized:

"I'm sorry to break in on you, but the zero hour is approaching, and we shall just have time to fly to New York and be in at the kill."

Hoskins gasped: "You don't mean—" He leaped to his feet, grabbed his hat and coat. "Come on. Let's go!"

When the uproar started, the stocky man glanced sharply at the leader.

"Excellency—" he began.

He stopped as he saw that the gaunt man was sitting with the phone still in his fingers, staring straight ahead of him. Uneasily, Birdman watched as the receiver dropped finally from the other's fingers, watched as the man sat there his face like a dark, lifeless mask.

Birdman ventured: "Excellency, you were saying just before the phone lights came on that now that our positions on the Moon and nearly all our engines have been captured, we would use those that escaped as a nucleus for piratical depradations on the interplanetary highways that will now be opened up. We would become, you said, the pirates of the twenty-first and twenty-second centuries. We—"

He stopped, froze in horror. The long, bony fingers of the other were groping into a desk drawer. They came out holding a Mauser automatic.

As Lipton and Hoskins and a dozen other men burst into the room, the stocky man was on his feet facing the spare-built man at the desk, who was raising a revolver up to his forehead.

"Excellency," Birdman was crying wildly, "you lied. You *are* afraid of the Shaposhenko punishment."

The pistol blared; and the gaunt man twisted in his brief agony, and slid to the floor. Birdman stood over him with a numb terror; he felt but dimly the presence of the intruders.

As he was led away, there was in him only wave after wave of utter disillusionment.

They were still perspiring. The cave where they had been frantically trying to bring down the roof was too narrow for so many men; and Pendrake, who was gasping with the rest for his share of the oxygen-depleted air, was just thinking: "Have to order the crew back—"

At that moment the messenger arrived. Pendrake listened in a stark wonder at the man who had come from Devlin: "A German prisoner, who died, says their camps are being attacked by American armies. Whatever the reason, the Nazis are withdrawing toward the surface—"

Pendrake said: "Impossible! "It's a trick. Nobody on Earth even knows about the Nazis being here, and besides, how did they get to the Moon so swiftly. There couldn't be another engine lying in a hillside—and the Nazis wouldn't give up after all these months of digging after us. Where's Devlin?"

But an hour later there was no doubt. Whatever the reason, the fight was over. "We'll have to send a patrol to find out what happened!" Pendrake said.

He saw with a start that Devlin was staring at him queerly. "Look, boss," the man said diffidently, "I'll lead that patrol. As for you—well—the men have been wonderin' what you and your wife are going to do now.

"Wait!" he went on in a violent tone, although Pendrake had made no attempt to interrupt. "This is a serious business. We're all pretty well agreed that this place oughtn't to get known. We've got something here that can't be shared with a billion people, at least not until somebody figures out how it works.

"What I mean is, go and talk things over with your wife and—What's the matter?"

Pendrake was smiling. "My wife and I have already talked things over. You may remember that I told you that our first child was born dead."

"Yes?"

"What I didn't tell you is that she can't have any more children. That's what she was taking so hard. Our blood dies forever with us. We've *got* to be personally immortal.

"What we have in mind," he went on swiftly, "will mean bringing a few carefully selected teachers from Earth, and equipment. If we can get agreement on it, we'll start a system of education down here that will take full advantage of the gradual increase in everybody's intelligence. Big Oaf was proof that such an increase does take place. I've even got an idea for the tiger for some time in the future when we get these Lunar machines working—"

"Listen," said Devlin, "what I get out of these words is that you're staying. Am I right?"

"Right."

They grinned at each other. Then they shook hands. Pendrake said finally:

"We'd better get going. I want us, if possible, to get one of the atomic engines, and I've got to see those American forces with my own eyes—"

Four days later he saw—swarms of ships with great streaks of red fire flaring from tubes in the rear. Pendrake took one long startled look, and gasped:

"Rocket ships!"

EPILOGUE

It was a spring morning fifty years later. Len Christopher, assistant keeper, New York Greater Zoological Gardens, walked slowly along the line of big cat cages. Suddenly, he stopped and stared at a vast, metal-barred structure that glittered in the rays of the rising sun.

"Funny," he muttered, "I swear that wasn't there last night. Wonder when it arri—"

He stopped. The top of his head made a valiant effort to unfasten from the rest of him. For a moment he stood gaping at the blue-green-yellow-red nightmare that loomed colossal behind the four-inch metal bars. And then—

Then he was running, yelling, for the superintendent's office.

THE END.

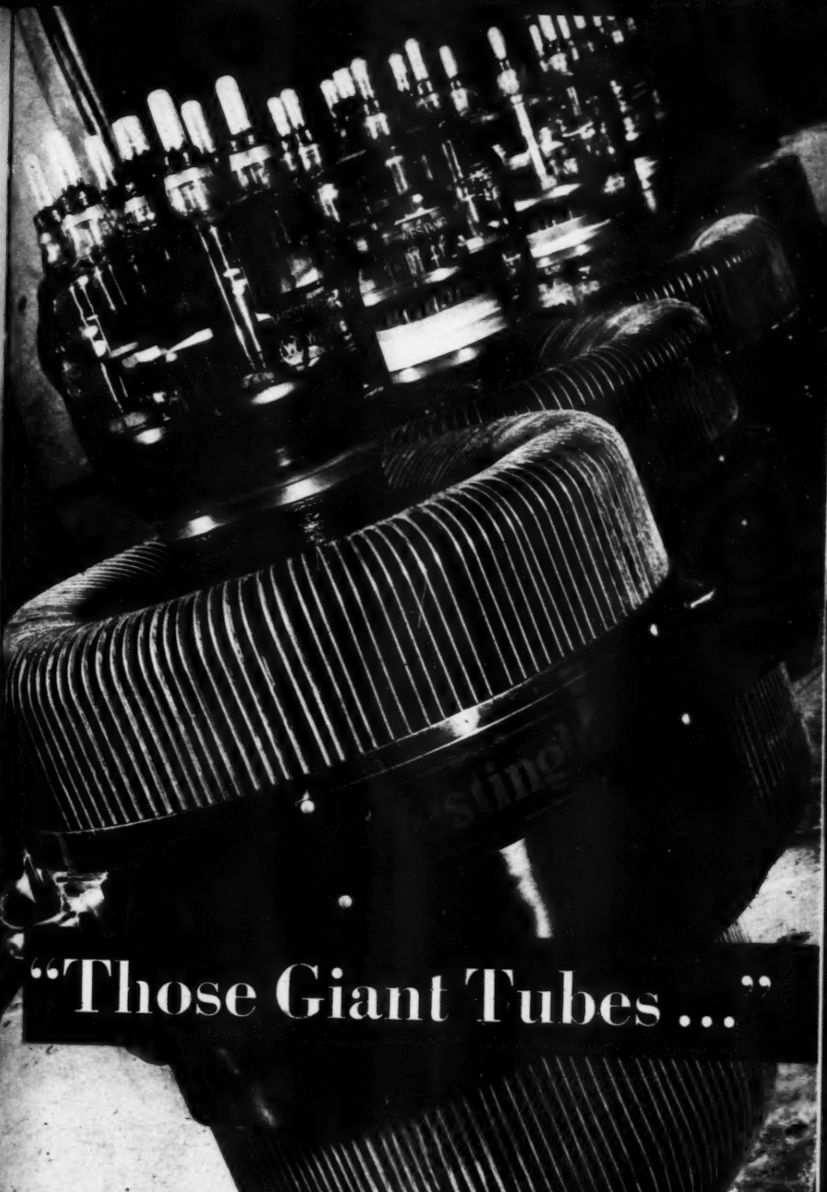
THE ANALYTICAL LABORATORY

Having stuck my neck a bit outward in prophesying that the ending of "Judgment Night" would be liked, I'm not unnaturally pleased to see that the voting seems to agree with my bet. The 1-2-3 order of the yarns in the September issue, incidentally, was a very general choice. Most of the point votes for "Judgment Night" were ones, for "Attitude" twos, and for "Concealment," threes. (Since a 2-2-5 series of votes gives a point score of 3, even though no one voted it in third place, the third-place story isn't always generally voted in third place.) The scores stood, when the present issue went to press:

Place	*Story*	*Author*	*Points*
1.	Judgment Night	C. L. Moore	1.5
2.	Attitude	Hal Clement	2.4
3.	Concealment	A. E. van Vogt	2.65
4.	Robinc	H. H. Holmes	4.15
5.	Doodad	Ray Bradbury	4.20

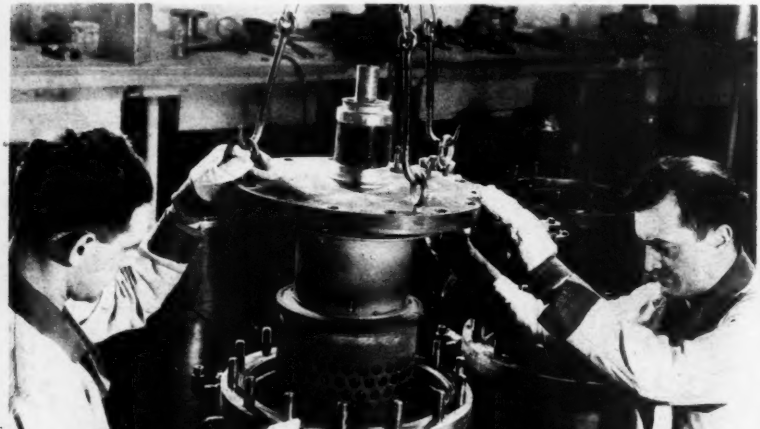
In the Highly Improbable division, the First Class Liar award, and $20, go to Ray Bradbury, for "And Watch The Fountains." C. J. MacBeth gets $10 and the title of Liar, Second Class, for "Universal Solvent." Charles B. Davis said something in "You Said It"—something worth $5 and third place.

Speaking of Probability Zero—one of the reasons for its irregularity of appearance is that we try to include at least five, but not more than seven, stories in an issue. If there are only three stories, a man would need be a magician to miss a prize—which wouldn't be fair to the fellow who had to compete with seven stories the next month. If, in assembling the jig saw of inelastic type into the inelastic limits of the magazine format, we find there just plain isn't space for five, six or seven Peezee stories, the department is omitted. There's a real effort made to run it fairly regularly—but Brass Tacks is competing for the room not occupied by the main stories, and, as in this current issue, the available space may be such that Probability Zero or Brass Tacks, but not both, can be run. Then—well, we have with us Brass Tacks, but no Probability Zero. We'll try to have Peezee around next month. THE EDITOR.



"Those Giant Tubes ..."

The "giant tubes" of science-fiction are fact at Westinghouse. These rectifiers might fit Venus Equliateral—the 25,000-watt transmitters on the previous page are a bit small! Those tubes are used in an African station.



"Turn on The Moon —Make It Hotter!"

by R. S. Richardson

AN astronomer doesn't ordinarily deal with the Hollywood variety of stars—but when the movies need a technical adviser, he gets a chance to tell the stars what to do!

Have you ever come out of a motion-picture theater saying to yourself:

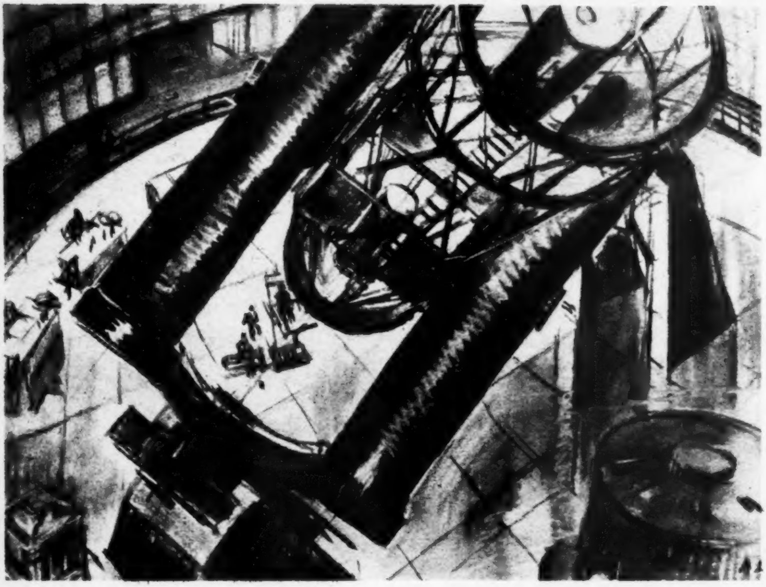
"Boy, do I wish I could have been the technical adviser on that picture? Were those scenes in the operating room screwy!" (Or courtroom, bakery, submarine, or whatever your specialty happens to be.) "That doctor said he was going to make a McBurney incision and then he started cutting right down the midline. You would think they would have somebody around to check up on those things."

Nothing can be quite so exquisitely painful as watching an actor deliberately doing a scene in what you know is exactly the wrong way. You want to rise up in your seat and yell, "Stop him, somebody! Go back. Put it down. Nobody ever did it that way since the beginning of time!"

Unfortunately the restraints of an artificial civilization prevent us from giving free expression to our emotions. Instead we can only suffer in silence while our glands start pouring out all kinds of insidious toxins into our system.

If the reader is like myself, he must have endured many such experiences. I recall seeing one of the last of the silent pictures in which the hero invited the leading lady up to his private observatory to have a look at Jupiter. After adjusting the eyepiece he turned to the young girl and said: "This is the planet Jupiter. Can you see its nine moons?"

Since all except the four big Galilean satellites are just on the limit of visibility in the world's largest telescopes, the heroine would have needed the vision of a superman to have seen even half a dozen moons.



Artist's working drawings for the telescope sets, showing a 100"-size reflector in a mount like that invented for the 200" Mt. Palomar telescope.

The point that I am trying to make is that I am now acting as technical adviser on a motion picture that is all about astronomy and astronomers, and thus unexpectedly find myself in a position to satisfy the pent-up desires of many years' standing.

The picture itself goes under the double-entendre of "The Heavenly Body" and is being filmed at the Metro-Goldwyn-Mayer studios in Culver City, California. Lest you get the impression that it is one of these educational films and so carefully avoid going to see it, let me hasten to add that the leading parts are played by Miss Hedy Lamarr and Mr. William Powell. Mr. Powell portrays an astronomer who discovers a comet that crashes into the moon. Miss Lamarr is his wife who takes up astrology in a serious way. As you might guess, this leads to some complications that require about six reels of film to get straightened out.

How do you get to be technical adviser on a motion picture?

The method is extremely simple. You get sick and stay at home from the office, tell the girl at the switchboard you don't want to be bothered, and try to make yourself as generally inaccessible as possible. (Since this article necessarily deals with the writer's own experiences, readers of Astounding must forgive me for making it more personal than those of the strictly scientific type in which the first person singular is rigorously suppressed.)

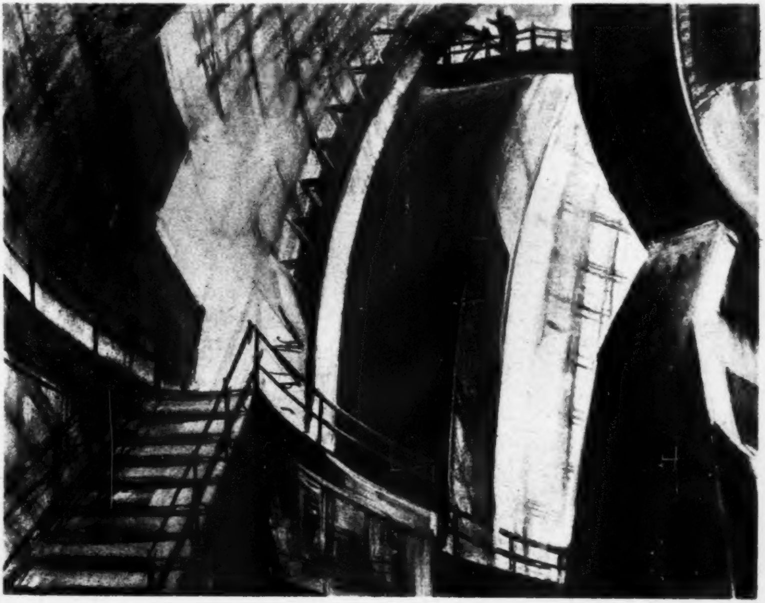
It all began last April while in a bad state of malaise from a strep throat infection. Time had slowed down until it was almost in reverse and the world looked thoroughly grim and dismal. I had read the newspapers, the latest magazines, and was even toying with the notion of looking at some scientific literature I had avoided for months, when the telephone rang.

"Probably got the wrong number," I said to myself. "Better not answer it."

But there is something about the insistent ring of a telephone that is hard to resist. You know it is only Aunt Mabel or your insurance agent, yet there is always the possibility that this time adventure is on the line. At any rate I answered it.

"Hello," I rasped into the transmitter.

View of the dome—that remained pure art work. Process shots made it unnecessary to undertake the expense of constructing the whole dome.



"Culver City calling. One moment, please."

Well, at least it was long distance. But who the devil could be calling from Culver City? There followed what sounded like a three-second burst of machine-gun fire. Finally the operator got the situation under control.

"Dr. Richardson?" a cultured voice inquired.

This was getting interesting. People seldom use the title unless they are after something.

"Yes," I replied, refusing to commit myself further.

"This is Mr. ——— speaking." I recognized the name of one of the biggest producers in the business. "One of your associates, Dr. Cecil B. White of the Mount Wilson Observatory, who has been acting as technical adviser on a picture we are making, has left suddenly to go into defense work. He mentioned you as one who might be interested in the position. Would you care to come out sometime and discuss the matter with us?"

"Well, all right," I said. "I think I might be able to manage it."

"That is fine, Dr. Richardson. We will telephone you later for an appointment at your convenience. Thank you."

It is my experience that the most noteworthy events in your life generally happen like that. Without the slightest warning you find yourself thrust into a situation where you never dreamed of being before.

I think I can say without exaggeration that my work as technical adviser on "The Heavenly Body" has been the most intensely interesting I have ever had. It has been in a very special kind of a little world that is carefully shut away from reality, among people of special ability who work hard at creating illusions for the entertainment of others. They take a portion of our ordinary kind of space time and transform it into various chunks of space time of their own choosing. Like any physical process, a lot of energy is required to do this. In particular, certain transformations cannot be made without the presence of a person who is thoroughly familiar with the inner workings of the world they intend to create. Which is where the technical adviser comes in.

The first job handed to me was that of reading the script. Scripts consist of one hundred fifty sheets of pulp paper bound together with brass staples on which are mimeographed the lines and directions of the play. This one had stamped upon the outside cover in large letters the word COMPLETE. I have since learned that scripts are never complete but are in a continual process of revision up until the actual moment of shooting, and even sometimes afterward. I naturally supposed that this one was in the finished state with perhaps a little polishing needed here and there. Instead, some parts of it had to be rewritten all over again.

Since a knowledge of the astronomical part of the production is necessary for an understanding of what follows, I will sketch it in very briefly.

An astronomer at the Mount Jefferson Observatory named Bill Whitley—Mr. William Powell—has discovered a comet which his calculations show is going to hit the moon. In the picture the comet is always kept below naked-eye visibility to prevent scenes in which the populace is getting stirred up over the event. While engaged in keeping track of his comet, trouble develops at home. His wife, Vicky—Miss Hedy Lamarr—is inveigled by the lady next door into taking up astrology. She visits an astrologer, hears things she supposed nobody knew but herself, and becomes a convert.

Bill reacts as any right-minded astronomer would react upon learning that his wife believes in astrology—he blows up and leaves home. The climax comes when Bill is about to address a gathering of distinguished astronomers who have assembled in the dome of the observatory to witness the collision between the comet and moon. It was necessary to invent a hypothetical device called a photoelectric scanner for this purpose. Just as he is about to face the audience he hears over the telephone that his wife has run off with the tall dark man predicted by the astrologer. Terribly shaken, he makes a mess of his speech, nearly breaks down in front of the crowd. As the comet strikes the moon at exactly the moment predicted, with the cheers of his fellow scientists ringing in his ears, Bill is the most miserable person there.

In addition to having an astronomer present to supervise the observatory scenes, the studio also employed an astrologer to handle the astrological sequences. The two of us never met, the studio evidently fearing that we would immediately start to tear each other apart upon sight. I always had the greatest curiosity to meet this individual, with the idea of asking some of the questions that people are continually asking me about astrology. Half of an astronomer's social time is spent in explaining that he doesn't know how to cast a horoscope.

I was asked to make a list of the technical errors after having read the script. Owing to the previous work of Dr. White, there were only a few that had crept in during his absence. Here are some of the most obvious ones, together with the corrections.

The scene is just after Bill has photographed his comet at the telescope and has taken the plate to the darkroom. Here is the way it read in the script:

LAP DISSOLVE
THE DARKROOM (ONLY A VERY DULL LIGHT)

Bill takes the photographic plate out of the holder, turns on the white light, and holds it up to the ground-glass screen. We see the negative of the identical picture of the comet of the previous shot.

Of course, you don't need to be an astronomer here. It would be a remarkable sort of photographic plate you could expose and then take directly out of the plate holder and find the image plainly visible upon it.

Here is another.

BILL (ADDRESSING THE CROWD THROUGH THE MICROPHONE)

The comet can now be seen approaching the moon at a speed of six million miles a second.

This is a little too fast even for a moving-picture comet. Most comets move in orbits that are nearly parabolic. A comet moving in a parabola near the earth's orbit would have a speed of twenty-five miles per second. The earth and moon together swing around the sun at the rate of eighteen miles per second. If, then, the comet and moon collided head-on, they would only be approaching each other with the speed of forty-three miles per second.

This one is harder to catch. In fact, I read the script three times before it caught me right between the eyes.

FADE-IN:

MOUNT JEFFERSON OBSERVATORY—THE DOME—ABOUT TEN O'CLOCK AT NIGHT

Open with a CLOSE-UP of BILL. As the CAMERA TRUCKS BACK we see BILL surrounded by his assistants.

Bill: Open up now, Pierson.

Pierson presses a button.

The dome opens slowly with hollow rumbling noises.

CUT TO:

THE NIGHT SKY (PHOTOGRAPHED THROUGH THE OPEN DOME)

The stars

The technical error here lies in opening the dome just before the astronomer starts to observe. As a rule, the dome is opened about sunset so that the interior will have plenty of time to cool down to the temperature of the ouside air. Air currents that might spoil the seeing and flexure in the mirror are thus partially eliminated. The studio decided to open up the dome regardless, as the scene of the shutter rolling back disclosing the stars was extremely effective.

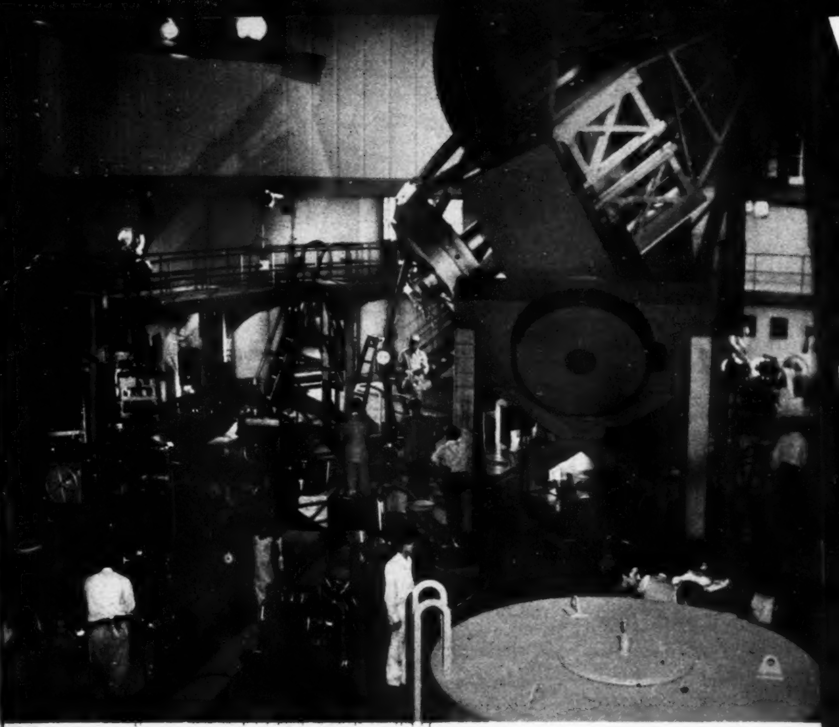
In addition to catching astronomical errors, the technical adviser is also called upon for lines that have an authentic ring to them. I was asked for a line in Bill's speech to the effect that if he hadn't made a mistake in his calculations, the comet was sure to hit the moon. One that sounded really powerful and dramatic.

After pondering the matter for several minutes, I finally came through with the following:

BILL (DICTATING TO HIS ASSISTANT):

"And should there be no error in my calculations, these two heavenly bodies are sure to intersect in their orbits."

To my amazement, everyone in the room, from the director to the stenographer, burst into laughter. They assured me that under no circumstances would the Hays office allow a line like that one to get by. I never realized what the moving-picture industry was up against before.



The set. The dome doesn't exist—but a wonderful maze of lights, cables, cameras, microphones, portable amplifiers, and massive equipment is concentrated on the action being shot. All this equipment and a complete crew of technicians were needed to show one janitor changing one light bulb!

One of the biggest headaches which the art department encountered was in depicting the stars in the night sky through the shutter of the observatory dome. Ordinarily the stars would be no trouble at all. They would be formed by scattering some holes around on a screen, putting a light behind it, and letting it go at that. No attempt is made to portray the acual constellations. When you are watching a musical comedy, who cares whether Orion is visible or not, or if the stars form strange patterns that originated only in the stage manager's imagination?

But it was felt that "The Heavenly Body" called for something a little special in the way of stars. For owing to the authentic background which the art department had gone to such pains to create, the whole effect might be destroyed if liberties were taken with the night

Continued on page 166

Keep 'Em Under

by Malcolm Jameson

***A** submarine is like a turtle—it lives under water, but must come up for air. You can kill it, render it useless, if you keep it under.*

The submarine is a paradoxical sort of warship. It is at once immensely destructive and highly vulnerable. It is the menace of the seas, yet lives itself in constant fear. It resembles the scorpion, virtually helpless except for its vicious sting, or the still more fragile cockroach that persists despite all campaigns against it through its skill in evasion. Like those pests the submarine makes its depredations by stealth. Its weapon is the silent, unseen torpedo; its shield invisibility.

On the surface the submarine is but one more type of armed vessel, and a relatively incompetent one at that. It is painfully slow as compared with its arch foes the destroyer and the light cruiser, it is undergunned as regards almost any warship of comparable tonnage, its freeboard is low and its horizon limited and its fire-control system necessarily primitive and sketchy. There is not room for range finders and elaborate tracking machines; the deck space for serving the guns is cramped, and in foul weather too wet for use. The submarine carries no armor beyond light splinter plating on the conning tower. *Any* hit on it may well prove fatal, however small the caliber of the shell, for the greatest of all the sub's weaknesses is its lack of reserve buoyancy. Where even the rustiest of old cargo ships could receive hit after hit and ship tons of water and still stay afloat on a reasonably even keel, the submarine is mortally injured by the slightest puncture of its skin. The sub is always in a state of delicate trim, and the admission of unwanted salt water not only tends to destroy the small store of spare buoyancy, but may send the sub reeling at crazy angles and out of control.

Buoyancy and trim are the key words to submarine performance.

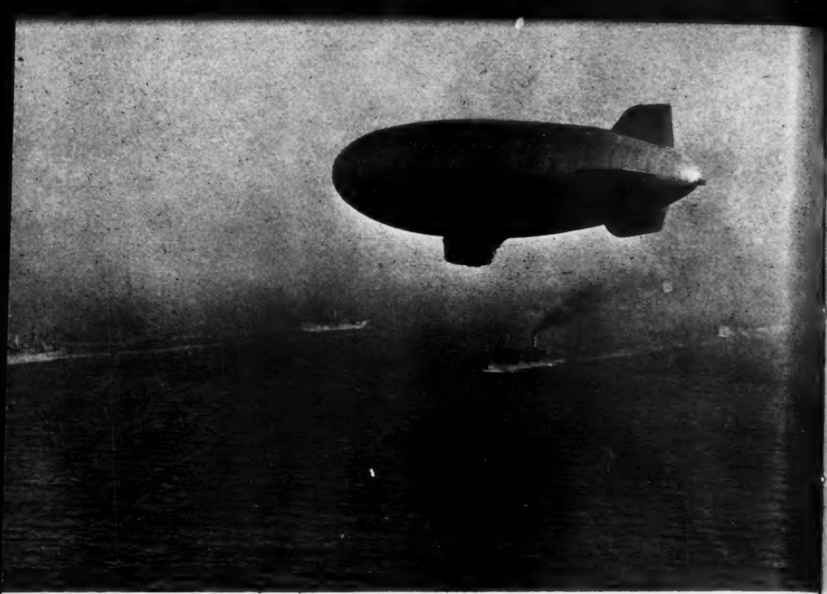
Coast Guard-International

There are lots of ways to "Keep 'em Under." This coast guard cutter—U. S. S. Spencer—sends an ash-can down. The sub came up—once only, before it went down for keeps under the fire of the cutter's deck guns.

Taken together they are the characteristic that sets the submersible apart from all other types. Variable buoyancy is the secret of its ability to dive and rise at will, quickly adjustable trim permits ready three-dimensional maneuverability beneath the surface. Both are exceedingly delicate matters, and are only correctly maintained by the constant exercise of skill and vigilance.

The regulation of buoyancy is what enables the sub to sink or rise. Taken alone it is similar to the performance of free balloons. If a closed vessel is made heavier than the fluid about it, it will descend; if made lighter, it will rise. In a submarine this variation of weight is achieved by means of the ballast tank. (See Diagrams A and B).

The Main Ballast tanks are of such capacity that when full they kill the bulk of the boat's positive buoyancy. Flooding of them will usually cause the boat to sink forthwith, since any residual buoyancy has already been computed and taken care of by means of the various



Navy Photo-International

Subs don't like being watched. Particularly, they don't like being watched by bomb-and-depth-charge-carrying blimps that see even submerged subs.

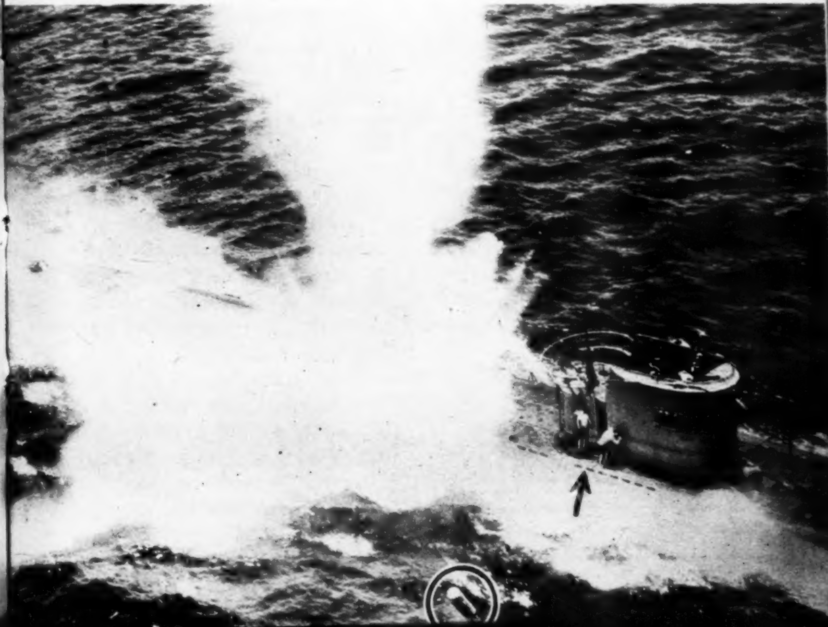
subsidiary tanks. Of these there are at least three, and frequently there are more. There are the forward and after trimming tanks, which, as the name implies, are used to *distribute* the loads within the boat. The position of these give great leverage as regards cant, and a few pounds placed judicially in one or the other of them can compensate for the shifting about of much greater weights closer to the center of the boat. In between the Main Ballasts are several smaller ballast tanks—called Auxiliary, Adjustment, or Regulator—which are used for adjusting the total weight. A boat setting out on a long cruise will be heavy with fuel, food and munitions, and will, therefore, carry the minimum of ballast. Later on, as these weights are expended, sea water must be taken in to maintain the boat's weight such that its commander can always be sure that he is heavy enough to get under quickly. Keeping in good diving trim is a continuous job.

If we imagine a sub in the midst of its mission in a war zone, the art of trimming and diving can be seen in detail. Beginning at the end of a busy day the submarine will surface as soon as it is safe to do so and commence charging batteries and compressing air. Later in the night it may proceed some miles on the surface. As dawn apporaches and brings with it the threat of hostile action, the sub must be ready to dive instantly at the first sign of danger. Unless the trim is right the sub may refuse to go under on short order, or it may plummet all the way to the ocean bottom and be crushed.

Careful records are kept of all expenditures, not only as to the amount in pounds, but with respect to the location. The fuel bunker, for example—as shown in the diagram—are abaft the after Main Ballast, but not in the extreme stern. Using a hundred pounds of oil from them will not only lighten the entire boat by that amount, but cause the stern to rise and the bow to dip. Other things being equal a bow-heavy submarine will tend to dive faster than one on an even keel because its angular position introduces a downward component in the thrust of the propellers quite independent of the position of the hydroplanes, or vertical rudders. When the sub commander goes to compensate for the used up fuel it is not sufficient to pump one hun-

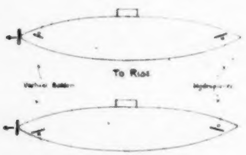
This is the really permanent way to keep 'em under. A navy photographer in a torpedo bomber caught this magnificent shot. That first delivery was enough to assure a kill, but the circled depth charge is on its way to make certain. Crew members on deck have a good chance of escape; those below—

Navy Photo-International



dred pounds of sea water into one of the auxiliaries. He must put a portion of it in after trim to keep the tail down. The exact placement is determined by tables posted in every boat. These tables take into account the lever arm of every one of the trimming and ballast tanks.

In like manner the sub's skipper must adjust for the food and fresh water consumed, and any ammunition or torpedoes shot away during the previous day's operations. In this connection he must not forget that after every torpedo is fired water rushes in and fills the tube. Before loading again that water must be drained into forward trim, thus partially compensating for the lost weight of the torpedo that was expended.



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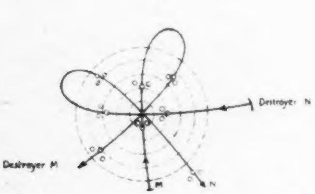

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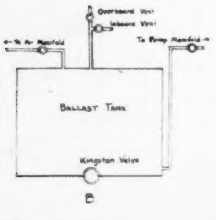


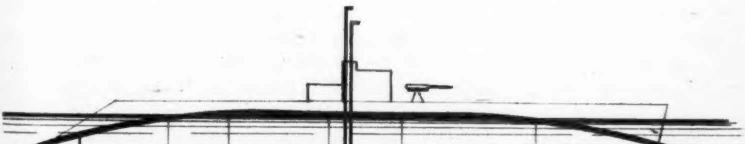
B

Correcting trim is a tricky job. There are two reasons for this. One is inherent in submersibles, the other is due to human frailty. A submarine has two conditions of stability—one when light and on the surface, the other when completely under. When the Main Ballasts are flooded there is a sickening moment of uncertainty as the boat tremblingly shifts from one condition to the other. It may have been in apparently perfect trim above, yet assume a disconcerting slant the moment it is under. This can be forestalled by thorough knowledge of the characteristics of the particular boat and painstaking care in compensation. Human frailty enters in that things are sometimes overlooked, or go unreported, or errors may be made in computation. Even veteran submarine men undergo a moment of anxiety when diving after a long period on the surface, for they can never be *sure* until they get under and see how the boat behaves.

The arrangements for securing trim are very flexible. The mentioned tanks are interconnected by pipelines and pump manifolds, so that the contents of any may be pumped into another, or from the tank to overboard, or vice versa. They are also fitted with wide area outboard valves known as Kingstons, through which they may be flooded directly from the sea without the use of pumps, it being necessary only to open the vents to allow the entrapped air to escape. The air may be vented either overboard or inboard as required. The tanks are also fitted with connections to the compressed air banks so that their contents may be blown out quickly.

Since the trimming tanks are seldom full and because of their profound effect on tilt, they are usually pumped—a specifically ordered number of pounds at a time. The Main Ballasts are almost invariably flooded and blown, since that is a far quicker means of utilizing them than pumping. The exception is usually when a sub becomes stuck on the bottom at dangerous depths. If the outside pressure is perilously close to the ultimate strength of the hull, to apply the additional air pressure inside the tank to eject the water might cause the inner tank walls to rupture and flood the boat. In that event the tanks could be safely lightened only by pumping against high pressure. (Pressures under salt water increase at the rate of .44 pounds per square inch per vertical foot.) The auxiliary ballast tanks may be pumped or blown, depending upon the situation and whether they are completely or partially full. A full tank may always be safely blown at ordinary depths, whereas the attempt to blow a partly filled tank may result in disaster.

The reason for this is not readily apparent, but it is sound. A submerged submarine in ideal trim will have less than a hundred pounds of positive or negative buoyancy, and, therefore, may be maneuvered in any direction with the minimum expenditure of motive power. Any much greater difference of buoyancy would either make the sub tend to break surface or sink rapidly unless high power and planing is brought to bear to hold it at the desired level. Either would cause an undesirable drain on the bat-



teries and thereby cut short the time that could be spent below. In that situation the commander would try to make adjustments by emergency pumping, but, if the error was large enough, he might find himself falling out of control. If so, he would be reaching depths of high pressure, and that is where the hazard lies. A hasty attempt to blow a half-filled tank might have a reverse effect. Unless he has taken the time to build up its air pressure to that outside, the moment the Kingston was opened sea water would rush in and compress the air bubble in the tank. The fact that there is ample high pressure air to blow the water out twenty or thirty seconds later would be of little avail. Submarine disasters occur in matter of seconds. In this instant the momentary *addition* of weight when it is desperately desired to get rid of it might spell ruin, as would a gentle shove to a man teetering on an ice-slick street.

This brings up momentum. Water differs from air in that it is incompressible. A balloon that was too heavy would not fall with free acceleration because it is constantly reaching strata of greater density. It might even find a level where it would cease falling and hang. There are no such denser levels in the ocean. If a submarine should make a stationary dive while being several hundred pounds heavy, it would begin falling, and would shortly attain considerable velocity. Unless prompt steps were taken to check the descent, it would fall at an ever-faster rate until it hit the bottom, *no matter how far down that might be.*

And, fantastic though it may seem to those who have not thought about it, the ratio of the weight that initiates the fall to the entire mass has little to do with it except as to the rate in the beginning. The weight of a good-sized dog is enough to start the proceedings. A little later, when the two-thousand-ton submarine is sinking at the rate of several feet per second, it will require heroic measures to undo the damage. Momentum is mass-times velocity, and the velocity having been gained the reduction in mass must be large, and must be made quickly. When it is considered that a submarine will likely be crushed in at something less than three hundred feet, there may not be time enough to save it even by blowing many tons from the Main Ballasts.

The foregoing treats only of the effects of bouyancy. Submarines would be impossibly clumsy if they depended on that alone. In actual practice they are seldom in perfect trim, but make up the deficiency by the use of power. They are fitted fore and aft with hydroplanes, or rudders that play up and down. The greater the forward momentum of the boat, the greater the planing effect. Here the sub resembles the airplane rather than the balloon. It is more like the blimp in that its weight is about the same as that of the fluid it displaces and may, therefore, be handled readily by the use of propellers and diving planes.

To insure full control, the prudent submarine commander always has his batteries and motors hooked up in series when he dives uncertain of his trim. He thus has his maximum power available to hold the boat as desired while compensating with pumps—a stark necessity in the presence of the enemy, for he dares not blow and come up to rectify the error. Such strenuous efforts are costly, though, since the batteries have the peculiarity of yielding less total power if drawn upon rapidly.

From this it should be apparent that every forced dive is hazardous. Or expensive, since they may compel the excessive use of current and compressed air. And, whether the submarine personnel is aware of it or not, wearing on the nerves. For there are other hazards besides those of bad trim. Before diving the ventilation must be shifted from outboard to inboard, the engine's air induction and exhausts sealed, hatches closed, and various valves manipulated. It is a truism that every member of the crew holds the lives of all the rest in his hand, for the omission of a single one of many operations may cause the loss of the boat. Or even the doing of some of them in the wrong order. It would be distinctly uncomfortable, if not fatal, for example, to carelessly shut off the engine's air supply before shutting down the engine. Diesels use a lot of air. With all hatches closed it would take only a few revolutions to reduce the internal air to a near vacuum.

There are some other hazards peculiar to submarines. When near the end of the charge, batteries gas freely, and the gas is hydrogen. A few percent of it in air is explosive, and as sub forced under just when it should be ventilating itself vigorously is in a bad spot. A spark from a motor or switch could easily cause an explosion. Another bugaboo is salt. Salt water in the lubricating oil will cause bearings to burn out and cylinder heads to crack. Its behavior in battery cells is worse. Electrolysis breaks it down into free chlorine—a most unpleasant shipmate—and the only way to get rid of it at sea is to charge the battery vigorously to eliminate it. This requires abundant ventilation, which can only be had on the surface, and is also injurious to the battery plates.

From the foregoing it can be seen that injuries that would be trifling to a surface vessel may be fatal to a submarine. The weight of water entering through started seams or holes of dropped rivets will give negative buoyancy; its fluidity will aggravate any fault of trim, since the free water will rush toward the lower end and emphasize any cant; and its salinity will play hob with the motive power. When a submarine is thrown out of control, it can only blow and come to the surface to face heavy gunfire, or go down to its doom.

Dealing with submarines is not difficult once they are located. The destroyer and similar patrol craft are to them as cats are to mice. They are fast and deadly. They possess more guns and a better fighting platform, and can drop the feared depth bombs in a series of patterns that are hard to escape. Such a one is indicated in Figure D. If the sub submerged at the point "O," and tries to run away submerged at top speed, its successive positions are the several concentric circles about it. Two destroyers can bomb all possible hiding spots by some form of cloverleaf operation as shown. The depth charge does not have to strike the sub or even come very close, the incompressible water transmitting the pressure wave with great fidelity over a considerable distance. The explosions may cave the submarine in, or they may toss it about and inflict minor injuries and leaks. But they may, and often do, force the sub to come up where it can be dealt with by the gun crews.

Aircraft are also a terror to the sub, for they, too, carry depth charges and ordinary bombs. In addition they carry radios and can summon surface craft. On account of their high speed and great range of visibility, they make effective patrols, and so far no submarine has brought one down by antiaircraft gunfire.* Submarines usually will submerge at the first sight of hostile aircraft, and deeply, for subs can be seen from the air in certain lights even when at considerable depths. This is a score against it, for it can do nothing as long as it is under unless under at its own volition while making a sneak attack on an unsuspecting target.

Subs are effective against other subs, as shown by the British performance in World War I. On several occasions they stalked U-boats and sank them, while in one astounding encounter a British E-boat tangled with a U-boat while both were submerged. They collided accidentally, and there ensued an underwater wrestling match as fantastic as anything in fiction. The German was impaled on the Englishman's bow, and the latter tried to bear him to the bottom by heavy flooring, since firing torpedoes would have done both of them in. The German countered by blowing everything and trying to lift the Britisher off. In the end the contest was a draw, they tearing apart in the end and each limping homeward badly damaged.

Merchant ships have been known to sink submarines, but the main value of their guns is to keep the sub at a distance so that his task will not be easy or accomplished quickly. Since the sub does not wish to risk being hit, it may prefer to use the torpedo approach instead. This may appear to be a minor advantage to the victim, but it is one nevertheless. The sub can carry but a limited number of torpedoes, and when those are exhausted it must return to base or hunt up its mother ship. The "Q" ships likewise had a bad effect on submarine morale. They did not sink many, but they taught them to treat the most innocent-looking cargo vessel with respect. Instead of shelling or planting demolition bombs at leisure, subs found it prudent thereafter to take no chances and to torpedo instead.

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*Since this was written, a freak incident wherein a submarine did succeed in getting a big, slow-moving blimp has occurred.

The above remarks have been made with the submarine in mind solely as a commerce raider—the aspect most in the public eye. They have other functions. Since their debut in the last war as a dependable branch of the service they have sunk or helped sink many first-class warships, including a number of battleships, aircraft carriers, cruisers and others. The record of the Allied subs in both wars has been quite as good or better than that of their opponents. Such attacks are usually costly, however, as the warships are well able to take care of themselves and are better screened than merchant convoys.

Submarines are especially valuable—or dangerous, depending on whose ox is gored—as minelayers. They can mine localities unsuspected and directly under coastal guns where no other type of minelayer could hope to operate and live. The German UC-boats were particularly active in this respect in the first World War. They mined the Atlantic coast of the United States and thereby sank the cruiser *San Diego,* damaged the battleship *Minnesota,* and destroyed a number of coastwise ships before we suspected that mines and not torpedoes were the cause.

The British destroyed such a minelayer by an ingenious ruse. A sub kept mining the approaches to a British port, and the British as patiently swept them. One day they did it differently. They sent the minesweepers out, but the sweeps hanging over their sterns were attached to nothing. After going through the motions of a careful sweeping job, the sweepers returned to port. That night the sub came back to load the channel again. Yes, it bumped into one of its own mines.

A more methodical method of submarine defense on the negative side is the placing of submerged nets. It is true that subs are fitted with net cutters, but their action is not positive, and moreover even the strands of a cut net can damage the sub—chiefly by getting tangled in its propellers or jamming the shafts. Such nets also have mines fastened to them, and the agitation set up by the struggling sub will draw them toward him and set them off with an effect similar to that of depth charges. Other types of mine barriers have proved most destructive to subs—as those across the English Channel and across the North Sea from Scotland to Norway.

Altogether, the lot of the submariner is not a happy one, despite the scare he sometimes throws into us and the undeniable damage he does. Every man's hand is against him, including those of his own people, for submarines are shot at first and challenged afterward. He works alone and every move he makes is attended by the threat of sudden death. When he dies in action—and he often does—the world does not know when or how. His death may be swift, or again by slow asphyxiation in the dark of the ocean bed. While he lives he is always in discomfort, cooped up under artificial light in cramped quarters and breathing smelly air. In the winter he is always cold, for he is immersed in icy brine and energy for heating is too precious to be expended. Yet there are plenty of men who like it.

As said, the submarine's shield is invisibility. The submarines that get away are the ones that are not sighted until it is too late. But the sub, even when submerged, is not entirely lost to perception. It may be invisible, but it is audible. Water is an excellent conductor of sound, and the modern hydrophone a delicate precision instrument. It can pick up the sound of churning propellers miles away and can determine the direction. At shorter ranges it can hear the internal noises of submarines, such as running pumps, or men walking about inside and whistling or talking. A submarine lying doggo must also keep very quiet. Destroyers know that trick, too. When there are enough of them to spare, one will stay behind after laying depth-charge patterns and wait, motionless, above. In the listening match that ensues the one with the greatest patience wins.

There are other devices for locating subs. An adaptation of the continuous sonic depth finder picks them up by sending out sound waves and recording the reflected sound. A new radio device does something similar by bouncing radio waves off the boats—which works well at night when the sub is unseen but on the surface. There are undoubtedly others unknown to the public and that cannot be revealed now. There will be still others invented in the future. It should not be forgotten, though, that the submarine is an underwater creature. What works against it also works for it. Hydrophones are an example. They are useful in picking up concealed subs, but submerged subs can also use them to track its victims or its foes. None of these devices are good for anything but comparatively short ranges.

It is the opinion of this writer that it is extremely unlikely that any of these, present or unknown, will seal the doom of the submarine. They will only tend to make submarine offense, and the defense against it more technical, the one keeping pace with the other. The Whitehead torpedo was acclaimed in the Gay Nineties as the instrument that would wipe out the surface fleets of the world. It has not done so. Twenty years ago Billy Mitchell made a similar announcement, that time with the airplane as the fatal weapon. That prophecy has yet to come true. It is true that the airplane is a useful adjunct in submarine hunting. It is equally true that the airplane is a valuable aid to the sub. German scouting planes have repeatedly spotted convoys and radioed the news about them to packs of U-boats lying in ambush ahead. Antisubmarine devices are two-edged weapons. Anything that works under water can be made to work both ways.

It is improbable that modern navies will willingly relinquish the use of submarines as a legitimate type of warship with legitimate duties to perform. It is unlikely that the means can be found with which to exterminate them. But their depredations can be kept within bounds. The answer, it seems to me, is patrol craft—scads of them, both on the surface and in the air. If they are sufficiently numerous, they can make it too dangerous for a sub to ever show itself during good daylight, and fairly unsafe even on the darkest nights. The risks and discomforts of submarining will increase progressively, and their returns diminish. The submarine on the surface and surrounded by enemies is a gone duck nine times out of ten. His capacity to do damage when kept submerged *all the time* is greately reduced. The slogan should be—

"Keep 'em under!"

THE END.

Statement of the Ownership, Management, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Astounding Science-Fiction, published monthly, at New York, N. Y., for October 1, 1943.

State of New York, County of New York (ss.)

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared H. W. Ralston, who, having been duly sworn according to law, deposes and says that he is Vice President of Street & Smith Publications, Inc., publishers of Astounding Science-Fiction, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: *Publishers,* Street & Smith Publications, Inc., 79-89 Seventh Avenue, New York, N. Y.; *editor,* John W. Campbell, Jr., 79 Seventh Avenue, New York, N. Y.; *managing editors,* none; *business managers,* none.

2. That the owners are: Street & Smith Publications, Inc., 79-89 Seventh Avenue, New York, N. Y., a corporation owned through stock holdings by Gerald H. Smith, 89 Seventh Avenue, New York, N. Y.; Ormond V. Gould, 89 Seventh Avenue, New York, N. Y.; Allen L. Grammer, 89 Seventh Avenue, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders, owning or holding 1 percent or more of total amount of bonds, mortgages or other securities are: None.

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H. W. RALSTON, Vice President,
Of Street & Smith Publications, Inc.,
publishers.

Sworn to and subscribed before me this 30th day of September, 1943. De Witt C. Van Valkenburgh, Notary Public No. 34, New York County. (My commission expires March 30, 1944.)

Gallegher Plus

by Lewis Padgett

Illustrated by Alfred

***Gallegher**, as usual, was in a jam. It wasn't his fault; it was due to Gallegher-plus, the highly successful—if sufficiently high!—other self.*

Gallegher peered dimly through the window at the place where his back yard should have been and felt his stomach dropping queasily into that ridiculous, unlikely hole gaping there in the earth. It was big, that hole. And deep. Almost deep enough to hold Gallegher's slightly colossal hangover.

But not quite. Gallegher wondered if he should look at the calendar, and then decided against it. He had a feeling that several thousand years had passed since the beginning of the binge. Even for a man with his thirst and capacity, it had been one hell of a toot.

"Toot," Gallegher mourned, crawling toward the couch and collapsing on it. "Binge is far more expressive. Toot makes me think of fire engines and boat whistles, and I've got those in my head, anyway—all sounding off at once." He reached up weakly for the siphon of the liquor organ, hesitated, and communed briefly with his stomach.

GALLEGHER: Just a short one, maybe?

STOMACH: Careful, there!

GALLEGHER: A hair of the dog—

STOMACH: O-O-O-OH!

GALLEGHER: Don't do that! I need a drink. My back yard's disappeared.

STOMACH: I wish I could.

At this point the door opened and a robot entered, wheels, cogs, and gadgets moving rapidly under its transparent skin plate. Gallegher took one look and closed his eyes, sweating.

"Get out of here," he snarled. "I curse the day I ever made you. I hate your revolving guts."

"You have no appreciation of beauty," said the robot in a hurt voice. "Here. I've brought you some beer."

"Hm-m-m!" Gallegher took the plastibulb from the robot's hand and drank thirstily. The cool catnip taste tingled refreshingly against the back of his throat. "A-ah," he said, sitting up. "That's a little better. Not much, but—"

"How about a thiamin shot?"

"You know I'm allergic to the stuff," Gallegher told his robot morosely. "I'm cursed with thirst. Hm-m-m!" He looked at the liquor organ. "Maybe—"

"There a policeman to see you."

"A what?"

"A policeman. He's been hanging around for quite a while."

"Oh," Gallegher said. He stared into a corner by an open window. "What's that?"

It looked like a machine of some curious sort. Gallegher eyed it with puzzled interest and a touch of amazement. No doubt he had built the damned thing. That was the only way the erratic scientist ever worked. He'd had no technical training, but, for some weird reason, his subconscious mind was gifted with a touch of genius. Conscious, Gallegher was normal enough, though erratic and often drunk. But when his demon subconscious took over, anything was liable to happen. It was in one of these sprees that he had built this robot, spending weeks thereafter trying to figure out the creature's basic purpose. As it turned out, the purpose wasn't an especially useful one, but Gallegher kept the robot around, despite its maddening habit of hunting up mirrors and posturing vainly before them, admiring its metallic innards.

"I've done it again," Gallegher thought. Aloud he said, "More beer, stupid. Quick."

As the robot went out, Gallegher uncoiled his lanky body and wandered across to the machine, examining it curiously. It was not in operation. Through the open window extended some pale, limber cables as thick as his thumb; they dangled a foot or so over the edge of the pit where the back yard should have been. They ended in—Hm-m-m! Gallegher pulled one up and peered at it. They ended in metal-rimmed holes, and were hollow. Odd.

The machine's over-all length was approximately two yards, and it looked like an animated junk heap. Gallegher had a habit of using makeshifts. If he couldn't find the right sort of connection, he'd snatch the nearest suitable object—a buttonhook, perhaps, or a coat hanger—and use that. Which meant that a qualitative analysis of an already-assembled machine was none too easy. What, for example, was that fibroid duck doing wrapped around with wires and nestling contentedly on an antique waffle iron?

"This time I've gone crazy," Gallegher pondered. "However, I'm not in trouble as usual. Where's that beer?"

The robot was before a mirror, staring fascinated at his middle. "Beer? Oh, right here. I paused to steal an admiring little glance at me."

Gallegher favored the robot with a foul oath, but took the plastibulb. He blinked at the gadget by the window, his long, bony face twisted in a puzzled scowl. The end product—

The ropy hollow tubes emerged from a big feed box that had once been a wastebasket. It was sealed shut now, though a gooseneck led from it into a tiny convertible dynamo, or its equivalent. "No," Gallegher thought. "Dynamos are big, aren't they? Oh, I wish I'd had a technical training. How can I figure this out, anyway?"

There was more, much more, including a square gray metal locker—Gallegher, momentarily off the beam, tried to estimate its contents in cubic feet. He made it four hundred eighty-six, which was obviously wrong, since the box was only eighteen inches by eighteen inches by eighteen inches.

The door of the locker was closed; Gallegher let it pass temporarily and continued his futile investigation. There were more puzzling gadgets. At the very end was a wheel, its rim grooved, diameter four inches.

"End product—what? Hey, Narcissus."

"My name is not Narcissus," the robot said reprovingly.

"It's enough to have to look at you, without trying to remember your name," Gallegher snarled. "Machines shouldn't have names, anyhow. Come over here."

"Well?"

"What *is* this?"

"A machine," the robot said, "but by no means as lovely as I."

"I hope it's more useful. What does it do?"

"It eats dirt."

"Oh. That explains the hole in the back yard."

"There *is* no back yard," the robot pointed out accurately.

"There is."

"A back yard," said the robot, quoting in a confused manner from Thomas Wolfe, "is not only back yard but the negation of back yard. It is the meeting in Space of back yard and no back yard. A back yard is finite and unextended dirt, a fact determined by its own denial."

"Do you know what you're talking about?" Gallegher demanded, honestly anxious to find out.

"Yes."

"I see. Well, try and keep the dirt out of your conversation. I want to know why I built this machine."

"Why ask me? I've been turned off for days—weeks, in fact."

"Oh, yeah. I remember. You were posing before the mirror and wouldn't let me shave that morning."

"It was a matter of artistic integrity. The planes of my functional face are far more coherent and dramatic than yours."

"Listen, Narcissus," Gallegher said, keeping a grip on himself. "I'm trying to find out something. Can the planes of your blasted functional brain follow that?"

"Certainly," Narcissus said coldly. "I can't help you. You turned me on again this morning and fell into a drunken slumber. The machine was already finished. It wasn't in operation. I cleaned house and kindly brought you beer when you woke up with your usual hangover."

"Then kindly bring me some more and shut up."

"What about the policeman?"

"Oh, I forgot him. Uh . . . I'd better see the guy, I suppose."

Narcissus retreated on softly padding feet. Gallegher shivered, went to the window, and looked out at that incredible hole. Why? How? He ransacked his brain. No use, of course. His subconscious had the answer, but it was locked up there firmly. At any rate, he wouldn't have built the machine without some good reason. Or would he? His subconscious possessed a peculiar, distorted sort of logic. Narcissus had originally been intended as a super beer-can opener.

A muscular young man in a dapper uniform came in after the robot. "Mr. Gallegher?" he asked.

"Yeah."

Mr. Galloway Gallegher?"

"The answer's still 'yeah.' What can I do for you?"

"You can accept this summons," said the cop. He gave Gallegher a folded paper.

The maze of intricate legal phraseology made little sense to Gallegher. "Who's Dell Hopper?" he asked. "I never heard of him."

"It's not my pie," the officer grunted. "I've served the summons; that's as far as I go."

He went out. Gallegher peered at the paper. It told him little.

Finally, for lack of something better to do, he televised an attorney, got in touch with the bureau of legal records, and found the name of Hopper's lawyer, a man named Trench. A corporation lawyer at that. Trench had a battery of secretaries to take calls, but by dint of threats, curses and pleas Gallegher got through to the great man himself.

On the telescreen Trench showed as a gray, thin, dry man with a clipped mustache. His voice was file-sharp.

"Mr. Gallegher? Yes?"

"Look," Gallegher said, "I just had a summons served on me."

"Ah, you have it, then. Good."

"What do you mean, good? I haven't the least idea what this is all about."

"Indeed," Trench said skeptically. "Perhaps I can refresh your memory. My client, who is soft-hearted, is not prosecuting you for slander, threat of bodily harm, or assault and battery. He just wants his money back—or else value received."

Gallegher closed his eyes and shuddered. "H-he does? I . . . ah . . . did I slander him?"

"You called him," said Trench, referring to a bulky file, "a duck-footed cockroach, a foul-smelling Neanderthaler, and either a dirty cow or a dirty *cao*. Both are terms of opprobium. You also kicked him."

"When was this?" Gallegher whispered.

"Three days ago."

"And—you mentioned money?"

"A thousand credits, which he paid you on account."

"On account of what?"

"A commission you were to undertake for him. I was not acquainted with the exact details. In any case, you not only failed to fulfill the commission, but you refused to return the money."

"Oh. Who is Hopper, anyway?"

"Hopper Enterprises, Inc.—Dell

Hopper, entrepreneur and impresario. However, I think you know all this. I will see you in court, Mr. Gallegher. And, if you'll forgive me, I'm rather busy. I have a case to prosecute today, and I rather think the defendant will get a long prison sentence."

"What did he do?" Gallegher asked weakly.

"Simple case of assault and battery," Trench said. "Good-by."

His face faded from the screen. Gallegher clapped a hand to his forehead and screamed for beer. He went to his desk, sucking at the plastibulb with its built-in refrigerant, and thoughtfully examined his mail. Nothing there. No clue.

A thousand credits— He had no recollection of getting them. But the cash book might show—

It did. Under dates of several weeks back, it said:

Rec'd D. H.—com.—on acc't—c1,000
Rec'd J. W.—com.—on acc't—c1,500
Rec'd Fatty—com.—on acc't—c800.

Thirty-three hundred credits! And the bank book had no record of that sum. It showed merely a withdrawal of seven hundred credits, leaving about fifteen still on hand.

Gallegher moaned and searched his desk again. Under a blotter he found an envelope he had previously overlooked. It contained stock certificates—both common and preferred—for something called Devices Unlimited. A covering letter acknowledged receipt of four thousand credits, in return for which payment stock had been issued to Mr. Galloway Gallegher, as ordered—

"Murder," Gallegher said. He gulped beer, his mind swirling. Trouble was piling up in triplicate. D. H.—Dell Hopper—had paid him a thousand credits to do something or other. Someone whose initials were J. W. had given his fifteen hundred credits for a similar purpose. And Fatty, the cheapskate, had paid only eight hundred credits on account.

Why?

Only Gallegher's mad subconscious knew. That brainy personality had deftly arranged the deals, collected the dough, depleted Gallegher's personal bank account—cleaning it out—and buying stock in Devices Unlimited. Ha!

Gallegher used the televisor again. Presently he beamed his broker.

"Arnie?"

"Hi, Gallegher," Arnie said, looking up at the teleplate over his desk. "What's up?"

"I am. At the end of a rope. Listen, did I buy some stock lately?"

"Sure. In Devices—DU."

"Then I want to sell it. I need the dough, quick."

"Wait a minute." Arnie pressed buttons. Current quotations were flashing across his wall, Gallegher knew.

"Well?"

"No soap. The bottom's dropped out. Four asked, nothing bid."

"What did I buy at?"

"Twenty."

Gallegher emitted the howl of a wounded wolf. *"Twenty?* And you let me do that?"

"I tried to argue you out of it," Arnie said wearily. "Told you the stock was skidding. There's a delay in a construction deal or something—not sure just what. But you said you had inside info. What could I do?"

"You could have beaten my brains out," Gallegher said. "Well, never mind. It's too late now. Have I got any other stock?"

"A hundred shares of Martian Bonanza."

"Quoted at?"

"You could realize twenty-five credit on the whole lot?"

"What are the bugles blowin' for?" Gallegher murmured.

"Huh?"

"I'm dreadin' what I've got to watch—"

"I know," Arnie said happily. "Danny Deever."

"Yeah," Gallegher agreed. "Danny Deever. Sing it at my funeral, chum." He broke the beam.

Why, in the name of everything holy and unholy, had he bought that DU stock?

What had he promised Dell Hopper of Hopper Enterprises?"

Who were J. W. (fifteen hundred credits) and Fatty (eight hundred credits)?

Why was there a hole in place of his back yard?

What and why was that confounded machine his subconscious had built?

He pressed the directory button on the televisor, spun the dial till he located Hopper Enterprises, and called that number.

"I want to see Mr. Hopper."

"Your name?"

"Gallegher."

"Call our lawyer, Mr. Trench."

"I did," Gallegher said. "Listen—"

"Mr. Hopper is busy."

"Tell him," Gallegher said wildly, "that I've got what he wanted."

That did it. Hopper focused in, a buffalo of a man with a mane of gray hair, intolerant jet-black eyes, and a beak of a nose. He thrust his jutting jaw toward the screen and bellowed, "Gallegher? For two pins I'd—" He changed his tune abruptly. "You called Trench, eh? I thought that'd do the trick. You know I can send you to prison, don't you?"

"Well, maybe—"

"Maybe nothing! Do you think I come personally to see every crackpot inventor who does some work for me? If I hadn't been told over and over that you were the best man in your field, I'd have slapped an injunction on you days ago!"

Inventor?

"The fact is," Gallegher began mildly, "I've been ill—"

"In a pig's eye," Hopper said coarsely. "You were drunk as a lord. I don't pay men for drinking. Did you forget those thousand credits were only part payment—with nine thousand more to come?"

"Why . . . why, n-no. Uh . . . nine thousand?"

"Plus a bonus for quick work. You still get the bonus, luckily. It's only been a couple of weeks. But it's lucky for you you got the thing finished. I've got options on a couple of factories already. *And* scouts looking out for good locations, all over the country. Is it practical for small sets, Gallegher? We'll make our steady money from them, not from the big audiences."

"*Tchwuk,*" Gallegher said. "Uh —"

"Got it there? I'm coming right down to see it."

"Wait! Maybe you'd better let me add a few touches—"

"All I want is the idea," Hopper said. "If that's satisfactory, the rest is easy. I'll call Trench and have him quash that summons. See you soon."

He blanked out.

Gallegher screamed for beer. "And a razor," he added, as Narcissus padded out of the room. "I want to cut my throat."

"Why?" the robot asked.

"Just to amuse you, why else? Get that beer."

Narcissus brought a plastibulb. "I don't understand why you're so upset," he remarked. "Why don't you lose yourself in rapturous contemplation of my beauty?"

"Better the razor," Gallegher said glumly. "Far better. Three clients, two of whom I can't remember at all, commissioning me to do jobs I can't remember, either. Ha!"

Narcissus ruminated. "Try induction," he suggested. "That machine—"

"What about it?"

"Well, when you get a commission, you usually drink yourself into such a state that your subconscious takes over and does the job. Then you sober up. Apparently that's what happened this time. You made the machine, didn't you?"

"Sure," Gallegher said, "but for which client? I don't even know what it does."

"You could try it and find out."

"Oh. So I could. I'm stupid this morning."

"You're always stupid," Narcissus said. "And very ugly, too. The more I contemplate my own perfect loveliness, the more pity I feel for humans."

"Oh, shut up," Gallegher snapped, feeling the uselessness of trying to argue with a robot. He went over to the enigmatic machine and studied it once more. Nothing clicked in his mind.

There was a switch, and he flipped it. The machine started to sing "St. James Infirmary."

"—to see my sweetie there
She was lying on a marble sla-a-ab—"

"I see it all," Gallegher said in a fit of wild frustration. "Somebody asked me to invent a phonograph."

"Wait," Narcissus pointed out. "Look at the window."

"The window. Sure. What about it? *Wh—*" Gallegher hung over the sill, gasping. His knees felt unhinged and weak. Still, he might have expected something like this.

The group of tubes emerging from the machine were rather incredibly telescopic. They had stretched down to the bottom of the pit, a full thirty feet, and were sweeping around in erratic circles like grazing vacuum cleaners. They moved so fast Gallegher couldn't see them except as blurs. It was like watching the head of a Medusa who had contracted St. Vitus' Dance and transmitted the ailment to her snakes.

"Look at them whiz," Narcissus said contemplatively, leaning heavily on Gallegher. "I guess that's what made the hole. They eat dirt."

"Yeah," the scientist agreed, drawing back. "I wonder why. Dirt— Hm-m-m. Raw material." He peered at the machine, which was wailing:

—can search the wide world over
And never find another sweet man like
me.

"Electrical connections," Gallegher mused, cocking an inquisitive eye. "The raw dirt goes in that one-time wastebasket. Then what? Electronic bombardment? Protons, neutrons, positrons—I *wish* I knew what those words meant," he ended plaintively. "If only I'd had a college education!"

"A positron is—"

"Don't tell me," Gallegher pleaded. "I'll only have semantic difficulties. I know what a positron is, all right, only I don't identify it with that name. All I know is the extensional meaning. Which can't be expressed in words, anyhow."

"The intensional meaning can, though," Narcissus pointed out.

"Not with me. As Humpty Dumpty said, the question is, which is to be master. And with me it's the word. The damn things scare me. I simply don't *get* their intensional meanings."

"That's silly," said the robot. "Positron has a perfectly clear connotation."

"To you. All it means to me is a gang of little boys with fishtails and green whiskers. That's why I never can figure out what my subconscious has been up to. I have to use symbolic logic, and the symbols . . . ah, shut up," Gallegher growled. "Why should I argue about semantics with you, anyhow?"

"You started it," Narcissus said.

Gallegher glared at the robot and then went back to the cryptic machine. It was still eating dirt and playing "St. James Infirmary."

"Why should it sing that, I wonder?"

"You usually sing it when you're drunk, don't you? Preferably in a barroom."

"That solves nothing," Gallegher said shortly. He explored the machine. It was in smooth, rapid operation, emitting a certain amount of heat, and something was smoking. Gallegher found a lubricating valve, seized an oil can, and squirted. The smoke vanished, as well as a faint smell of burning.

"Nothing comes out," Gallegher

said, after a long pause of baffled consideration.

"There?" The robot pointed.

Gallegher examined the grooved wheel that was turning rapidly. Just above it was a small circular aperture in the smooth hide of a cylindrical tube. Nothing seemed to be coming out of that hole, however.

"Turn the switch off," Gallegher said. Narcissus obeyed. The valve snapped shut and the grooved wheel stopped turning. Other activity ceased instantly. The music died. The tentacles stretched out the window stopped swirling and shortened to their normal inactive length.

"Well, there's apparently no end product," Gallegher remarked. "It eats dirt and digests it completely. Ridiculous."

"Is it?"

"Sure. Dirt's got elements in it. Oxygen, nitrogen—there's granite under New York, so there's aluminum, sodium, silicon—lots of things. No sort of physical *or* chemical change could explain this."

"You mean something ought to come out of the machine?"

"Yes," Gallegher said. "In a word, exactly. I'd feel a lot better if something did. Even mud."

"Music comes out of it," Narcissus pointed out. "If you can truthfully call that squalling music."

"By no stretch of my imagination can I bring myself to consider that loathsome thought," the scientist denied firmly. "I'll admit my subconscious is slightly nuts. But it's got logic, in a mad sort of way. It wouldn't build a machine to convert dirt into music, even if such a thing's possible."

"But it doesn't do anything else, does it?"

"No. Ah. Hm-m-m. I wonder what Hopper asked me to make for him. He kept talking about factories and audiences."

"He'll be here soon," Narcissus said. "Ask him."

Gallegher didn't bother to reply. He thought of demanding more beer, rejected the idea, and instead used the liquor organ to mix himself a pick-me-up of several liqueurs. After that he went and sat on a generator which bore the conspicuous label of Monstro. Apparently dissatisfied, he changed his seat to a smaller generator named Bubbles.

Gallegher always thought better atop Bubbles.

The pick-me-up had oiled his brain, fuzzy with alcohol fumes. A machine without an end product—dirt vanishing into nothingness. Hm-m-m. Matter cannot disappear like a rabbit popping into a magician's hat. It's got to go somewhere. Energy?

Apparently not. The machine didn't manufacture energy. The cords and sockets showed that, on the contrary, it made use of electric power to operate.

And so—

What?

Try it from another angle. Gallegher's subconscious, Gallegher Plus, had built the device for some logical reason. The reason was supplied by his profit of thirty-three hundred credits. He'd been paid that sum, by three different people, to make—maybe—three different things.

Which of them fitted the machine?

Look at it as an equation. Call clients a, b, and c. Call the purpose of the machine—not the machine itself, of course—x. Then a (or) b (or) c equals x.

Not quite. The term a wouldn't represent Dell Hopper; it would symbolize what he wanted. And what he wanted must necessarily and logically be the purpose of the machine.

Or the mysterious J. W., or the equally mysterious Fatty.

Well, Fatty was a shade less enigmatic. Gallegher had a clue, for what it was worth. If J. W. was represented by b, Fatty would be c plus adipose tissue. Call adipose tissue t, and what did you get?

Thirsty.

Gallegher had more beer, distracting Narcissus from his posturing before the mirror. He drummed his heels against Bubbles, scowling, a lock of dark hair falling lankly over his eyes.

Prison?

Uh! No, there must be some other answer, somewhere. The DU stock, for example. Why had Gallegher Plus bought four thousand credits' worth of the stuff when it was on the skids?

If he could find the answer to that, it might help. For Gallegher Plus did nothing without purpose. What was Devices Unlimited, anyway?

He tried the televisor Who's Who in Manhattan. Luckily Devices was corporated within the State and had business offices here. A full-page ad flipped into view.

DEVICES UNLIMITED
WE DO EVERYTHING!
RED 5-1400-M

Well, Gallegher had the firm's 'visor number, which was something. As he began to call RED, a buzzer murmured, and Narcissus turned petulantly from the mirror and went off to answer the door. He returned in a moment with the bisonlike Mr. Hopper.

"Sorry to be so long," Hopper rumbled. "My chauffeur went through a light, and a cop stopped us. I had to bawl the very devil out of him."

"The chauffeur?"

"The cop. Now where's the stuff?"

Gallegher licked his lips. Had Gallegher Plus actually kicked this mountainous guy in the pants? It was not a thought to dwell upon.

He pointed toward the window. "There." Was he right? Had Hopper ordered a machine that ate dirt?

The big man's eyes widened in surprise. He gave Gallegher a swift, wondering look, and then moved toward the device, inspecting it from all angles. He glanced out the window, but didn't seem much interested in what he saw there. Instead, he turned back to Gallegher with a puzzled scowl.

"You mean this? A totally new principle, is it? But then it must be."

No clue there. Gallegher tried a feeble smile. Hopper just looked at him.

"All right," he said. "What's the practical application?"

Gallegher groped wildly. "I'd better show you," he said at last, crossing the lab and flipping the switch. Instantly the machine started to sing "St. James Infirmary." The tentacles lengthened and began to eat dirt. The hole in the cylinder opened. The grooved wheel began to revolve.

Hopper waited.

After a time he said, "Well?"

"You—don't like it?"

"How should I know? I don't even know what it does. Isn't there any screen?"

"Sure," Gallegher said, completely at a loss. "It's inside that cylinder."

"In—*what?*" Hopper's shaggy brows drew down over his jet-black eyes. *"Inside that cylinder?"*

"Uh-huh."

"For—" Hopper seemed to be choking. "What good is it there? Without X-ray eyes, anyhow?"

"Should it have X-ray eyes?" Gallegher muttered, dizzy with bafflement. "You wanted a screen with X-ray eyes?"

"You're still drunk!" Hopper snarled. "Or else you're crazy!"

"Wait a minute. Maybe I've made a mistake—"

"A mistake!"

"Tell me one thing. Just what did you ask me to do?"

Hopper took three deep breaths. In a cold, precise voice he said, "I asked you if you could devise a method of projecting three-dimensional images that could be viewed from any angle, front, back or side, without distortion. You said yes. I paid you a thousand credits on account. I've taken options on a couple of factories so I could begin manufacturing without delay. I've had scouts out looking for likely theatres. I'm planning a campaign for selling the attachments to home televisors. And now, Mr. Gallegher, I'm going out and see my attorney and tell him to put the screws on."

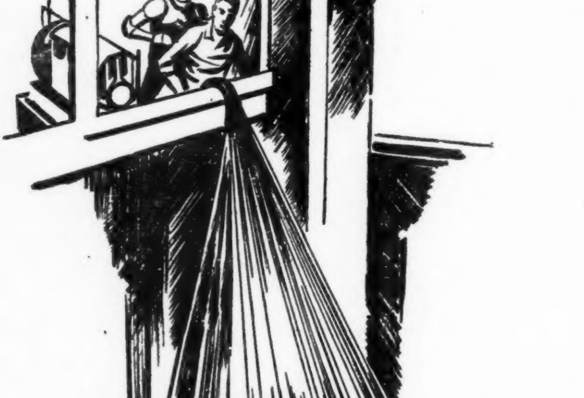
He went out, snorting. The robot gently closed the door, came back, and, without being asked, hurried after beer. Gallegher waved it away.

"I'll use the organ," he moaned, mixing himself a stiff one. "Turn that blasted machine off, Narcissus. I haven't the strength."

"Well, you've found out one thing," the robot said encouragingly. "You didn't build the device for Hopper."

"True. True. I made it for . . . ah . . . either J. W. or Fatty. How can I find out who they are?"

"You need a rest," the robot said. "Why not simply relax and listen to my lovely melodious voice? I'll read to you."



"It's not melodious," Gallegher said automatically and absently. "It squeaks like a rusty hinge."

"To your ears. *My* senses are different. To me, your voice is the croaking of an asthmatic frog. You can't see me as I do, any more than you can hear me as I hear myself. Which is just as well. You'd swoon with ecstasy."

"Narcissus," Gallegher said patiently, "I'm trying to think. Will you kindly shut your metallic trap?"

"My name isn't Narcissus," said the robot. "It's Joe."

"Then I'm changing it. Let's see. I was checking up on DU. What was that number?"

"Red five fourteen hundred M."

"Oh, yeah." Gallegher used the televisor. A secretary was willing but unable to give much useful information.

Devices Unlimited was the name of a holding company, of a sort. It had connection all over the world. When a client wanted a job done, DU, through its agents, got in touch with the right person and fenagled the deal. The trick was that DU supplied the money, financing operations and working on a percentage basis. It sounded fantastically intricate, and Gallegher was left in the dark.

"Any record of my name in your files? Oh— Well, can you tell me who J. W. is?"

"J. W.? I'm sorry, sir. I'll need the full name—"

"I don't have it. And this is important." Gallegher argued. At last he got his way. The only DU man whose initials were J. W. was someone named Jackson Wardell, who was on Callisto at the moment.

"How long has he been there?"

"He was born there," said the secretary unhelpfully. "He's never been to Earth in his life. I'm sure Mr. Wardell can't be your man."

Gallegher agreed. There was no use asking for Fatty, he decided, and broke the beam with a faint sigh. Well, what now?

The visor shrilled. On the screen appeared the face of a plump-cheeked, bald, pudgy man who was frowning worriedly. He broke into a relieved chuckle at sight of the scientist.

"Oh, there you are, Mr. Gallegher," he said. "I've been trying to reach you for an hour. Something's wrong with the beam. My goodness, I thought I'd certainly hear from you before this!"

Gallegher's heart stumbled. *Fatty* —of course!

Thank Heaven, the luck was beginning to turn! Fatty—eight hundred credits. On account. On account of what? The machine? Was it the solution to Fatty's problem, or to J. W.'s? Gallegher prayed with brief fervency that Fatty had requested a device that ate dirt and sang "St. James Infirmary."

The image blurred and flickered, with a faint crackling. Fatty said hurriedly, "Something's wrong with the line. But—did you do it, Mr. Gallegher? Did you find a method?"

"Sure," Gallegher said. If he

could lead the man on, gain some hint of what he had ordered—

"Oh, wonderful! DU's been calling me for days. I've been putting them off, but they won't wait forever. Cuff's bearing down hard, and I can't get around that old statute—"

The screen went dead.

Gallegher almost bit off his tongue in impotent fury. Hastily he closed the circuit and began striding around the lab, his nerves tense with expectation. In a second the visor would ring. Fatty would call back. Naturally. And this time the first question Gallegher would ask would be, "Who are you?"

Time passed.

Gallegher groaned and checked back, asking the operator to trace the call.

"I'm sorry, sir. It was made from a dial visor. We cannot trace calls made from a dial visor."

Ten minutes later Gallegher stopped cursing, seized his hat from its perch atop an iron dog that had once decorated a lawn, and whirled to the door. "I'm going out," he snapped to Narcissus. "Keep an eye on that machine."

"All right. One eye." The robot agreed. "I'll need the other to watch my beautiful insides. Why don't you find out who Cuff is?"

"What?"

"Cuff. Fatty mentioned somebody by that name. He said he was bearing down hard—"

"Check! He did, at that. And —what was it?—he said he couldn't get around an old statue—"

"Statute. It means a law."

"I know what statute means," Gallegher growled. "I'm not exactly a driveling idiot. Not yet, anyhow. Cuff, eh? I'll try the visor again."

There were six Cuffs listed. Gallegher eliminated half of them by gender. He crossed off Cuff-Linx Mfg. Co., which left two—Max and Fredk. He televised Frederick, getting a pop-eyed, scrawny youth who was obviously not yet old enough to vote. Gallegher gave the lad a murderous glare of frustration and flipped the switch, leaving Frederick to spend the next half-hour wondering who had called him, grimaced like a demon, and blanked out without a word.

But Max Cuff remained, and that, certainly, was the man. Gallegher felt sure of it when Max Cuff's butler transferred the call to a downtown office, where a receptionist said that Mr. Cuff was spending the afternoon at the Uplift Social Club.

"That so? Say, who is Cuff, anyhow?"

"I beg your pardon?"

"What's his noise? His business, I mean?"

"Mr. Cuff has no business," the girl said frigidly. "He's an alderman."

That was interesting. Gallegher looked for his hat, found it on his head, and took leave of the robot, who did not trouble to answer. "If Fatty calls up again," the scientist commanded, "get his name. See?

And keep your eye on that machine, just in case it starts having mutations or something."

That seemed to tie up all the loose ends. Gallegher let himself out of the house. A cool autumn wind was blowing, scattering crisp leaves from the overhead parkways. A few taxiplanes drifted past, but Gallegher hailed a street cab; he wanted to see where he was going. Somehow he felt that a telecall to Max Cuff would produce little of value. The man would require deft handling, especially since he was "bearing down hard."

"Where to. bud?"

"Uplift Social Club. Know where it is?"

"Nope," said the driver, "but I can find out." He used his teledirectory on the dashboard. "Downtown. 'Way down."

"O. K.," Gallegher told the man, and dropped back on the cushions, brooding darkly. Why was everybody so elusive? His clients weren't usually ghosts. But Fatty remained vague and nameless—a face, that was all, and one Gallegher hadn't recognized. Who J. W. was anyone might guess. Only Dell Hopper had put in an appearance, and Gallegher wished he hadn't. The summons rustled in his pocket.

"What I need," Gallegher soliloquized. "is a drink. That was the whole trouble. I didn't stay drunk. Not long enough, anyhow. Oh. damn."

Presently the taxi stopped at what had once been a glassbrick mansion, now grimy and forlorn-looking. Gallegher got out, paid the driver, and went up the ramp. A small placard said Uplift Social Club. Since there was no buzzer, he opened the door and went in.

Instantly his nostrils twitched like the muzzle of a war horse scenting cordite. There was drinking going on. With the instinct of a homing pigeon, Gallegher went directly to the bar, set up against one wall of a huge room filled with chairs, tables, and people. A sad-looking man with a derby was playing a pin-ball machine in a corner. He looked up as Gallegher approached, lurched into his path, and murmured, "Looking for somebody?"

"Yeah," Gallegher said. "Max Cuff. They told me he was here."

"Not now," said the sad man. "What do you want with him?"

"It's about Fatty," Gallegher hazarded.

Cold eyes regarded him. "Who?"

"You wouldn't know him. But Max would."

"Max want to see you?"

"Sure."

"Well." the man said doubtfully, "he's down at the Three-Star on a pub-crawl. When he starts that—"

"The Three-Star? Where is it?"

"Fourteenth near Broad."

"Thanks," Gallegher said. He went out. with a longing look at the bar. Not now—not yet. There was business to attend to first.

The Three-Star was a gin mill, with dirty pictures on the walls.

They moved in a stereoscopic and mildly appalling manner. Gallegher, after a thoughtful examination, looked the customers over. There weren't many. A huge man at one end of the bar attracted his attention because of the gardenia in his lapel and the flashy diamond on his ring finger.

Gallegher went toward him. "Mr. Cuff?"

"Right," said the big man, turning slowly on the barstool like Jupiter revolving on its axis. He eyed Gallegher, librating slightly. "Who're you?"

"I'm—"

"Never mind," said Cuff, winking. "Never give your right name after you've pulled a job. So you're on the lam, eh?"

"What?"

"I can spot 'em as far away as I can see 'em. You . . . you . . . hey!" Cuff said, bending forward and sniffing. "You been *drinking!*"

"Drinking," Gallegher said bitterly. "It's an understatement."

"Then have a drink with me," the big man invited. "I'm up to E now. Egg flip. Tim!" he roared. " 'Nother egg flip for my pal here! Step it up! And get busy with F."

Gallegher slid onto the stool beside Cuff and watched his companion speculatively. The alderman seemed a little tight.

"Yes," Cuff said, "alphabetical drinking's the only way to do it. You start with A—absinthe—and then work along, brandy, cointreau, daiquiri, egg flip—"

"Then what?"

"F, of course," Cuff said, mildly surprised. "Flip. Here's yours. Good lubrication!"

They drank. "Listen," Gallegher said, "I want to see you about Fatty."

"Who's he?"

"Fatty," Gallegher explained, winking significantly. "You know. You've been bearing down lately. The statute. You know."

"Oh! *Him!*" Cuff suddenly roared with Gargantuan laughter. "Fatty, huh? That's good. That's very good. Fatty's a good name for him, all right."

"Not much like his own, is it?" Gallegher said cunningly.

"Not a bit. Fatty!"

"Does he spell his name with an e or an i?"

"Both," Cuff said. "Tim, where's the flip? Oh, you got it ready, huh? Well, good lubrication, pal."

Gallegher finished his egg flip and went to work on the flip, which was identical except for the name. What now?

"About Fatty," he hazarded.

"Yeah?"

"How's everything going?"

"I never answer questions," Cuff said, abruptly sobering. He looked sharply at Gallegher. "You one of the boys? I don't know you."

"Pittsburgh. They told me to come to the club when I got in town."

"That doesn't make sense," Cuff said. "Oh, well. It doesn't matter. I just cleaned up some loose ends, and I'm celebrating. Through with your flip? Tim! Gin!"

They had gin for G, a horse's neck for H, and an eye-opener for I. "Now a Jazzbo," Cuff said with satisfaction. "This is the only bar in town that has a drink beginning with J. After that I have to start skipping. I dunno any K drinks."

"Kirchwasser," Gallegher said absently.

"K—huh? What's that?" Cuff bellowed at the bartender. "Tim! You got any kirchwasser?"

"Nope," said the man. "We don't carry it, alderman."

"Then we'll find somebody who does. You're a smart guy, pal. Come along with me. I *need* you."

Gallegher went obediently. Since Cuff didn't want to talk about Fatty, it behooved him to win the alderman's confidence. And the best way to do that was to drink with him. Unfortunately an alphabetical pub-crawl, with its fantastic mixtures, proved none too easy. Gallegher already had a hangover. And Cuff's thirst was insatiable.

"L? What's L?"

"Lachrymae Christi. Or Liebfraumilch."

"Oh, boy!"

It was a relief to get back to a Martini. After the Orange Blossm Gallegher began to feel dizzy. For R he suggested root beer, but Cuff would have none of that.

"Well, rice wine."

"Yeah. Rice—hey! We missed N! We gotta start over now from A!"

Gallegher dissuaded the alderman with some trouble, and succeeded only after fascinating Cuff with the exotic name ng ga po. They worked on, through sazeracs, tailspins, undergrounds, and vodka. W meant whiskey.

"X?"

They looked at each other through alcoholic fogs. Gallegher shrugged and stared around. How had they got into this swanky, well-furnished private clubroom, he wondered. It wasn't the Uplift, that was certain. Oh, well—

"X?" Cuff insisted. "Don't fail me now, pal."

"Extra whiskey," Gallegher said brilliantly.

"That's it. Only two left. Y and . . . and—what comes after Y?"

"Fatty. Remember?"

"Ol' Fatty Smith," Cuff said, beginning to laugh immoderately. At least, it sounded like Smith. "Fatty just suits him."

"What's his first name?" Gallegher asked.

"Who?"

"Fatty."

"Never heard of him," Cuff said, and chuckled. A page boy came over and touched the alderman's arm.

"Someone to see you, sir. They're waiting outside."

"Right. Back in a minute, pal. Everybody always knows where to find me—'specially here. Don't go. 'way. There's still Y and . . . and . . . and the other one."

He vanised. Gallegher put down his untasted drink, stood up, swaying slightly, and headed for the lounge. A televisor booth there caught his eye, and, on impulse, he went in and vised his lab.

"Drunk again," said Narcissus, as the robot's face appeared on the screen.

"You said it," Gallegher agreed. "I'm . . . *urp* . . . high as a kite. But I got a clue, anyway."

"I'd advise you to get a police escort," the robot said. "Some thugs broke in looking for you, right after you left."

"S-s-some what? Say that again."

"Three thugs," Narcissus repeated patiently. "The leader was a thin, tall man in a checkered suit with yellow hair and a gold front tooth. The others—"

"I don't want a description," Gallegher snarled. "Just tell me what happened?"

"Well, that's all. They wanted to kidnap you. Then they tried to steal the machine. I chased them out. For a robot, I'm pretty tough."

"Did they hurt the machine?"

"What about me?" Narcissus demanded plaintively. "I'm much more important than that gadget. Have you no curiosity about my wounds?"

"No," Gallegher said. "Have you some?"

"Of course not. But you could have demonstrated some slight curiosity—"

"Did they hurt that machine?"

"I didn't let them get near it," the robot said. "And the hell with you."

"I'll ring you back," Gallegher said. "Right now I need black coffee."

He beamed off, stood up, and wavered out of the booth. Max Cuff was coming toward him. There were three men following the alderman.

One of them stopped short, his jaw dropping. "Cripes!" he said. "That's the guy, boss. That's Gallegher. Is he the one you been drinking with?"

Gallegher tried to focus his eyes. The man swam into clarity. He was a tall, thin chap in a checkered suit, and he had yellow hair and a gold front tooth.

"Conk him," Cuff said. "Quick, before he yells. And before anybody else comes in here. Gallegher, huh? Smart guy, huh?"

Gallegher saw something coming at his head, and tried to leap back into the visor booth like a snail retreating into its shell. He failed. Spinning flashes of glaring light dazzled him.

He was conked.

The trouble with this social culture, Gallegher thought dreamily, was that it was suffering both from overgrowth and calcification of the exoderm. A civilization may be likened to a flowerbed. Each individual plant stands for a component part of the culture. Growth is progress. Technology, that long-frustrate daffodil, had had B_1 concentrate poured on its roots, the result of wars that forced its growth through sheer necessity. But no world is satisfactory unless the parts are equal to the whole.

The daffodil shaded another plant that developed parasitic tendencies. It stopped using its roots. It wound itself around the daffodil, climbing up on its stem and stalks and leaves, and that strangling liana was sociology, politics, economics, finance—outmoded forms that changed too slowly, outstripped by the blazing comet of the sciences, riding high in the unlocked skies of this new era. Long ago writers had theorized that in the future—their future—the sociological pattern would be different. In the day of rocketships such illogical *mores* as watered stock, dirty politics, and gangsters would not exist. But those theorists had not seen clearly enough. They thought of rocketships as vehicles of the far distant future.

Ley landed on the moon before automobiles stopped using carburetors.

The two great wars of the early twentieth century gave a violent impetus to technology, and that growth continued. Unfortunately most of the business of living was based on such matters as man hours and monetary fixed standards. The only parallel was the day of the great bubbles—the Mississippi Bubble and its brothers. It was, finally, a time of chaos, reorganization, sifting precariously from old standards to new, and a seesaw bouncing vigorously from one extreme to the other. The legal profession had become so complicated that batteries of experts needed Pedersen Calculators and the brain machines of Mechanistra to marshal their farfetched arguments, which went wildly into uncharted realms of symbolic logic and—eventually—pure nonsense. A murderer could get off scot-free provided he didn't sign a confession. And even if he did, there were ways of discrediting solid, legal proof. Precedents were shibboleths. In that maze of madness, administrators turned to historical solidities—legal precedents—and these were often twisted against them.

Thus it went, all down the line. Later sociology would catch up with technology. It hadn't, just yet. Economic gambling had reached a pitch never before attained in the history of the world. Geniuses were needed to straighten out the mess. Mutations eventually provided such geniuses, by natural compensation; but a long time was to pass until that satisfactory conclusion had been reached. The man with the best chance for survival, Gallegher had realized by now, was one with a good deal of adaptability and a first-class all-around stock of practical and impractical knowledge, versed in practically everything. In short, in matters vegetable, animal or mineral—

Gallegher opened his eyes. There was little to see, chiefly because, as he immediately discovered, he was slumped face down at a table. With an effort Gallegher sat up. He was unbound, and in a dimly lighted attic that seemed to be a storeroom;

it was littered with broken-down junk. A fluorescent burned faintly on the ceiling. There was a door, but the man with the gold tooth was standing before it. Across the table sat Max Cuff, carefully pouring whiskey into a glass.

"I want some," Gallegher said feebly.

Cuff looked at him. "Awake, huh? Sorry Blazer socked you so hard."

"Oh, well. I might have passed out anyway. Those alphabetical pub-crawls are really something."

"Heigh-ho," Cuff said, pushing the glass toward Gallegher and filling another for himself. "That's the way it goes. It was smart of you to stick with me—the one place the boys wouldn't think of looking."

"I'm naturally clever," Gallegher said modestly. The whiskey revived him. But his mind still felt foggy. "Your . . . uh . . . associates, by which I mean lousy thugs, tried to kidnap me earlier, didn't they?"

"Uh-huh. You weren't in. That robot of yours—"

"He's a beaut."

"Yeah. Look, Blazer told me about the machine you had set up. I'd hate to have Smith get his hands on it."

Smith—Fatty. Hm-m-m. The jigsaw was dislocated again. Gallegher sighed.

If he played the cards close to his chest—

"Smith hasn't seen it yet."

"I know that," Cuff said. "We've been tapping his visor beam. One of our spies found out he'd told DU he had a man working on the job—you know? Only he didn't mention the man's name. All we could do was shadow Smith and tap his visor till he got in touch with you. After that—well, we caught the conversation. You told Smith you'd got the gadget."

"Well?"

"We cut in on the beam, fast, and Blazer and the boys went down to see you. I told you I didn't want Smith to keep that contract."

"You never mentioned a contract," Gallelgher said.

"Don't play dumb. Smith told 'em, up at DU, that he'd laid the whole case before you."

Maybe Smith had. Only Gallegher had been drunk at the time, and it was Gallegher Plus who had listened, storing the information securely in the subconscious.

"So?"

Cuff burped. He pushed his glass away suddenly. "I'll see you later. I'm tight, blast it. Can't think straight. But—I don't want Smith to get that machine. Your robot won't let us get near it. You'll get in touch with him by visor and send him off somewhere, so the boys can pick up your gadget. Say yes or no. If it's no, I'll be back."

"No," Gallegher said. "On account of you'd kill me anyway, to stop me from building another machine for Smith."

Cuff's lids drew down slowly over his eyes. He sat motionless, seemingly asleep, for a time. Then he looked at Gallegher blankly and stood up.

"I'll see you later, then." He rubbed a hand across his forehead; his voice was a little thick. "Blazer, keep the lug here."

The man with the gold tooth came forward. "You O. K.?"

"Yeah. I can't think—" Cuff grimaced. "Turkish bath. That's what I need." He went toward the door, pulling Blazer with him. Gallegher saw the alderman's lips move. He read a few words.

"—drunk enough . . . vise that robot . . . try it—"

Then Cuff went out. Blazer came back, sat opposite Gallegher, and shoved the bottle toward him. "Might as well take it easy," he suggested. "Have another; you need it."

Gallegher thought: Smart guys. They figure if I get stinko, I'll do what they want. Well—

There was another angle. When Gallegher was thoroughly under the influence of alcohol, his subconscious took over. And Gallegher Plus was a scientific genius—mad, but good.

Gallegher Plus might be able to figure a way out of this.

"That's it," Blazer said, watching the liquor vanish. "Have another. Max is a good egg. He wouldn't put the bee on you. He just can't stand people helixing up his plans."

"What plans?"

"Like with Smith," Blazer explained.

"I see." Gallegher's limbs were tingling. Pretty soon he should be sufficiently saturated with alcohol to unleash his subconscious. He kept drinking.

Perhaps he tried too hard. Usually Gallegher mixed his liquor judiciously. This time, the factors of the equation added up to a depressing zero. He saw the surface of the table moving slowly toward his nose, felt a mild, rather pleasant bump, and began to snore. Blazer got up and shook him.

"One half so precious as the stuff they sell," Gallegher said thickly. "High-piping Pehlevi, with wine, wine, wine, wine. *Red* wine."

"Wine he wants," Blazer said. "The guy's a human blotter." He shook Gallegher again, but there was no response. Blazer grunted, and his footsteps sounded, growing fainter.

Gallegher heard the door close. He tried to sit up, slid off the chair, and banged his head agonizingly against a table leg.

It was more effective than cold water. Wavering, Gallegher crawled to his feet. The attic room was empty except for himself and other jetsam. He walked with abnormal carefulness to the door and tried it. Locked. Reinforced with steel, at that.

"Fine stuff," Gallegher murmured. "The one time I need my subconscious, it stays buried. How the devil can I get out of here?"

There was no way. The room had no windows, and the door was firm. Gallegher floated toward the piles of junk. An old sofa. A box of scraps. Pillows. A rolled carpet. Junk.

Gallegher found a length of wire, a bit of mica, a twisted spiral of plastic, once part of a mobile statuette, and some other trivia. He put them together. The result was a thing vaguely resembling a gun, though it had some resemblance to an egg beater. It looked as weird as a Martian's doodling.

After that, Gallegher returned to the chair and sat down, trying, by sheer will power, to sober up. He didn't succeed too well. When he heard footsteps returning, his mind was still fuzzy.

The door opened. Blazer came in, with a swift, wary glance at Gallegher, who had hidden the gadget under the table.

"Back, are you? I thought it might be Max."

"He'll be along, too," Blazer said. "How d'you feel?"

"Woozy. I could use another drink. I've finished this bottle." Gallegher had finished it. He had poured it down a rat hole.

Blazer locked the door and came forward as Gallegher stood up. The scientist missed his balance, lurched forward, and Blazer hesitated. Gallegher brought out the crazy egg-beater gun and snapped it up to eye level, squinting along its barrel at Blazer's face.

The thug went for something, either his gun or his sap. But the eerie contrivance Gallegher had leveled at him worried Blazer. His motion was arrested abruptly. He was wondering what menace confronted him. In another second he would act, one way or another—perhaps continuing that arrested smooth motion toward his belt.

Gallegher did not wait. Blazer's stare was on the gadget. With utter disregard for the Queensbury Rules, Gallegher kicked his opponent below the belt. As Blazer folded up, Gallegher followed his advantage by hurling himself headlong on the thug and bearing him down in a wild, octopuslike thrashing of lanky limbs. Blazer kept trying to reach his weapon, but that first foul blow had handicapped him.

Gallegher was still too drunk to co-ordinate properly. He compromised by crawling atop his enemy and beating the man repeatedly on the solar plexus. Such tactics proved effective. After a time, Gallegher was able to wrench the sap from Blazer's grasp and lay it firmly along the thug's temple.

That was that.

With a glance at the gadget, Gallegher arose, wondering what Blazer had thought it was. A death-ray projector, perhaps. Gallegher grinned faintly. He found the door key in his unconscious victim's pocket, let himself out of the attic, and warily descended a stairway. So far, so good.

A reputation for scientific achievements has its advantages. It had, at least, served the purpose of distracting Blazer's attention from the obvious.

What now?

The house was a three-story, empty structure near the Battery. Gallegher escaped through a window. He did not pause till he was in an airtaxi, speeding uptown. There, breathing deeply, he flipped the wind filter and let the cool night breeze cool his perspiring cheeks. A full moon rode high in the black autumn sky. Below, through the earth-view transparent panel, he could see the brilliant ribbons of streets, with slashing bright diagonals marking the upper level speedways.

Smith. Fatty Smith. Connected with DU, somehow—

With an access of caution, he paid off the pilot and stepped out on a rooftop landing in the White Way district. There were televisor booths here, and Gallegher called his lab. The robot answered.

"Narcissus—"

"Joe," the robot corrected. "And you've been drinking some more. Why don't you sober up?"

"Shut up and listen. What's been happening?"

"Not much."

"Those thugs. Did they come back?"

"No," Narcissus said, "but some officers came to arrest you. Remember that summons they served you with today? You should have appeared in court at 5 p. m."

Summons. Oh, yeah. Dell Hopper—one thousand credits.

"Are they there now?"

"No. I said you'd taken a powder."

"Why?" asked Gallegher.

"So they wouldn't hang around. Now you can come home whenever you like—if you take reasonable precautions."

"Such as what?"

"That's your problem," Narcissus said. "Get a false beard. I've done my share."

Gallegher said, "All right, make a lot of black coffee. Any other calls?"

"One from Washington. A commander in the space police unit. He didn't give his name."

"Space police! Are they after me, too? What did he want?"

"You," the robot said. "Good-by. You interrupted a lovely song I was singing to myself."

"Make that coffee," Gallegher ordered as the image faded. He stepped out of the booth and stood for a moment, considering, while he stared blankly at the towers of Manhattan rising around him, with their irregular patterns of lighted windows, square, oval, circular, crescent, or star-shaped.

A call from Washington.

Hopper cracking down.

Max Cuff and his thugs.

Fatty Smith.

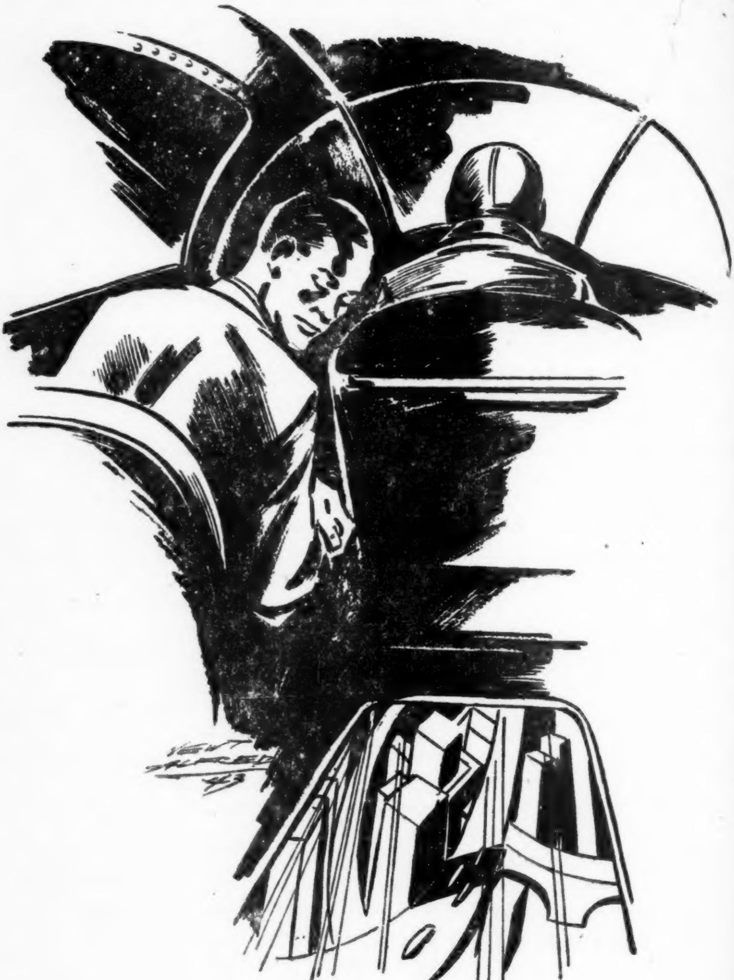
Smith was the best bet. He tried the visor again, calling DU.

"Sorry, we have closed for the day."

"This is important," Gallegher insisted. "I need some information. I've got to get in touch with a man—"

"I'm sorry."

"S-m-i-t-h," Gallegher spelled. "Just look him up in the file or something, won't you? Or do you want me to cut my throat while you



watch?" He fumbled in his pocket.

"If you will call tomorrow—"

"That'll be too late. Can't you just look it up for me? Please. Double please."

"Sorry."

"I'm a stockholder in DU," Gallegher snarled. "I warn you, my girl!"

"A . . . oh. Well, it's irregular, but—S-m-i-t-h? One moment. The first name is what?"

"I don't know. Give me all the Smiths."

The girl disappeared and came back with a file box labeled SMI. "Oh, dear," she said, riffling through the cards. "There must be several hundred Smiths."

Gallegher groaned. "I want a fat one," he said wildly. "There's no way of checking on that, I suppose."

The secretary's lips tightened. "Oh, a rib. I see. Good *night!*" She broke the connection.

Gallegher sat staring at the screen. Several hundred Smiths. Not so good. In fact, definitely bad.

Wait a minute. He had bought DU stock when it was on the skids. Why? He must have expected a rising market. But the stock had continued to fall, according to Arnie.

There might be a lead there.

He reached Arnie at the broker's home and was insistent. "Break the date. This won't take you long. Just find out for me why DU's on the skids. Call me back at my lab. Or I'll break your neck. And make it fast! Get that dope, understand?"

Arnie said he would. Gallegher drank black coffee at a counter stand, went home warily by taxi, and let himself into his house. He double-locked the door behind him. Narcissus was dancing before the big mirror in the lab.

"Any calls?" Gallegher said.

"No. Nothing's happened. Look at this graceful *pas.*"

"Later. If anybody tries to get in, call me. I'll hide till you can get rid of 'em." Gallegher squeezed his eyes shut. "Is the coffee ready?"

"Black and strong. In the kitchen."

The scientist went into the bathroom instead, stripped, cold-showered, and took a brief irradiation. Feeling less woozy, he returned to the lab with a gigantic cup full of steaming coffee. He perched on Bubbles and gulped the liquid.

"You look like Rodin's Thinker," Narcissus remarked. "I'll get you a robe. Your ungainly body offends my aesthetic feelings."

Gallegher didn't hear. He donned the robe, since his sweating skin felt unpleasantly cool, but continued to drink the coffee and stare into space.

"Narcissus. More of this."

Equation: a (or) b (or) c equals x. He had been trying to find the value of a, b, or c. Maybe that was the wrong way. He hadn't located J. W. at all. Smith remained a phantom. And Dell Hopper (one thousand credits) had been of no assistance.

It might be better to find the value of x. That blasted machine must have some purpose. Granted, it ate dirt. But matter cannot be destroyed; it can be changed into other forms.

Dirt went into the machine; nothing came out.

Nothing visible.

Free energy?

That was invisible, but could be detected with instruments.

Voltmeter, ammeter—gold leaf—

Gallegher turned the machine on again briefly. Its singing was dangerously loud, but no one rang the door buzzer, and after a minute or two Gallegher snapped the switch back to OFF. He had learned nothing.

Arnie called. The broker had secured the information Gallegher wanted.

"'Twasn't easy. I had to pull some wires. But I found out why DU stock's been dropping."

"Thank Heaven for that! Spill it."

"DU's a sort of exchange, you know. They farm out jobs. This one—it's a big office building to be constructed in downtown Manhattan. Only the contractor hasn't been able to start yet. There's a lot of dough tied up in the deal, and there's a whispering campaign that's hurt the DU stock."

"Keep talking."

Arnie went on. "I got all the info I could, in case. There were two firms bidding on the job."

"Who?"

"Ajax, and somebody named—"

"Not Smith?"

"That's it," Arnie said. "Thaddeus Smith. S-m-e-i-t-h, he spells it."

There was a long pause. "S-m-e-i-t-h," Gallegher repeated at last. "So that's why the girl at DU couldn't . . . eh? Oh, nothing. I ought to have guessed it." Sure. When he'd asked Cuff whether Fatty spelled his name with an e or an i, the alderman had said both. Smeith. Ha!

"Smeith got the contract," Arnie continued. "He underbid Ajax. However, Ajax has political pull. They got some alderman to clamp down and apply an old statute that put the kibosh on Smeith. He can't do a thing."

"Why not?"

"Because," Arnie said, "the law won't permit him to block Manhattan traffic. It's a question of air rights. Smeith's client—or DU's client, rather—bought the property lately, but air rights over it had been leased for a ninety-nine-year period to Transworld Strato. The stratoliners have their hangar just beyond that property, and you know they're not gyros. They need a straightaway course for a bit before they can angle up. Well, their right of way runs right over the property. Their lease is good. For ninety-nine years they've got the right to use the air over that land, above and over fifty feet above ground level."

Gallegher squinted thoughtfully. "How could Smeith expect to put up a building there, then?"

"The new owner possesses the

property from fifty feet above soil down to the center of the earth. Savvy? A big eighty-story building—most of it underground. It's been done before, but not against political pull. If Smeith fails to fulfill his contract, the job goes to Ajax—and Ajax is hand-in-glove with that alderman."

"Yeah. Max Cuff," Gallegher said. "I've met the lug. Still—what's this statute you mentioned?"

"An old one, pretty much obsolete, but still on the books. It's legal. I checked. You can't interfere with downtown traffic, or upset the stagger system of transport."

"Well?"

"If you dig a hole for an eighty-story building," Arnie said, "you get a lot of dirt and rock. How can you haul it away without upsetting traffic? I didn't try to figure out how many tons have to be removed."

"I see," Gallegher said softly.

"So there it is, on a platinum platter. Smeith took the contract. Now he's stymied. He can't get rid of the dirt he'll be excavating, and pretty soon Ajax will take over and wangle a permit to truck out the material."

"How—if Smeith can't?"

"Remember the alderman? Well, a few weeks ago some of the streets downtown were blocked off, for repairs. Traffic was rerouted—right by that building site. It's been siphoned off there, and it's so crowded that dirt trucks would tangle up the whole business. Of course it's temporary"—Arnie laughed shortly—"temporary until Smeith is forced out. Then the traffic will be rerouted again, and Ajax can wangle their permit."

"Oh." Gallegher looked over his shoulder at the machine. "There may be a way—"

The door buzzer rang. Narcissus made a gesture of inquiry.

Gallegher said, "Do me another favor, Arnie. I want to get Smeith down here to my lab, quick."

"All right, vise him."

"His visor's tapped. I don't dare. Can you hop over and bring him here, right away?"

Arnie sighed. "I certainly earn my commissions the hard way. But O. K."

He faded. Gallegher listened to the door buzzer, frowned, and nodded to the robot. "See who it is. I doubt if Cuff would try anything now, but—well, find out. I'll be in this closet."

He stood in the dark, waiting, straining his ears, and wondering. Smeith—he had solved Smeith's problem. The machine ate dirt. The only effective way to get rid of earth without running the risk of a nitrogen explosion.

Eight hundred credits, on account, for a device or a method that would eliminate enough earth—safely—to provide space for an underground office building, a structure that had to be mostly subterranean because of prior-leased air rights.

Fair enough.

Only—*where did that dirt go?*

Narcissus returned and opened

the closet door. "It's a Commander John Wall. He vised from Washington earlier tonight. I told you, remember?"

"John Wall?"

J. W., fifteen hundred credits! The third client!

"Let him in," Gallegher ordered breathlessly. "Quick! Is he alone?"

"Yes."

"Then step it up!"

Narcissus padded off, to return with a gray-haired, stocky figure in the uniform of the space police. Wall grinned briefly at Gallegher, and then his keen eyes shot toward the machine by the window.

"That it?"

Gallegher said, "Hello, commander. I . . . I'm pretty sure that's it. But I want to discuss some details with you first."

Wall frowned. "Money? You can't hold up the government. Or am I misjudging you? Fifty thousand credits should hold you for a while." His face cleared. "You have fifteen hundred already; I'm prepared to write you a check as soon as you've completed a satisfactory demonstration."

"Fifty thou—" Gallegher took a deep breath. "No, it isn't that, of course. I merely want to make certain that I've filled the terms of our agreement. I want to be sure I've met every specification." If he could only learn what Wall had requested! If he, too, had wanted a machine that ate dirt—

It was a farfetched hope, an impossible coincidence, but Gallegher had to find out. He waved the commander to a chair.

"But we discussed the problem in full detail—"

"A double-check," Gallegher said smoothly. "Narcissus, get the commander a drink."

"Thanks, no."

"Coffee?"

"I'd be obliged. Well, then—as I told you some weeks ago, we needed a spaceship control—a manual that would meet the requirements of elasticity and tensile strength."

"Oh-oh," Gallegher thought.

Wall leaned forward, his eyes brightening. "A spaceship is necessarily big and complicated. Some manual controls are required. But they cannot move in a straight line; construction necessitates that such controls must turn sharp corners, follow an erratic and eccentric path from *here* to *here*."

"Well—"

"Thus," Wall said, "you want to turn on a water faucet in a house two blocks away. And you want to do it while you're here, in your laboratory. How?"

"String. Wire. Rope."

"Which could wind around corners as . . . say . . . a rigid rod could not. However, Mr. Gallegher, let me repeat my statement of two weeks ago. *That faucet is hard to turn.* And it must be turned often, hundreds of times a day when a ship is in free space. Our toughest wire cables have proved unsatisfactory. The stress and strain snap them. When a cable is *bent*, and when it is also *straight*—you see?"

Gallegher nodded. "Sure. You can break wire by bending it back and forth often enough."

"That is the problem we asked you to solve. You said it could be done. Now—have you done it? And how?"

A manual control that could turn corners and withstand repeated stresses. Gallagher eyed the machine. Nitrogen—a thought was moving in the back of his mind, but he could not quite capture it.

The buzzer rang. "Smeith," Gallegher thought, and nodded to Narcissus. The robot vanished.

He returned with four men at his heels. Two of them were uniformed officers. The others were, respectively, Smeith and Dell Hopper.

Hopper was smiling savagely. "Hello, Gallegher," he said. "We've been waiting. We weren't fast enough when this man"—he nodded toward Commander Wall—"came in, but we waited for a second chance."

Smeith, his plump face puzzled, said, "Mr. Gallegher, what is this? I rang your buzzer, and then these men surrounded me—"

"It's O. K.," Gallegher said. "You're on top, at least. Look out that window."

Smeith obeyed. He popped back in again, beaming.

"That hole—"

"Right. I didn't cart the dirt away, either. I'll give you a demonstration presently."

"You will in jail," Hopper said acidly. "I warned you, Gallegher, that I'm not a man to play around with. I gave you a thousand credits to do a job for me, and you neither did the job nor returned the money."

Commander Wall was staring, his coffee cup, forgotten, balanced in one hand. An officer moved forward and took Gallegher's arm.

"Wait a minute," Wall began, but Smeith was quicker.

"I think I owe Mr. Gallegher some credits," he said, snatching out a wallet. "I've not much more than a thousand on me, but you can take a check for the balance, I suppose. If this—gentleman—wants cash, there should be a thousand here."

Gallegher gulped.

Smeith nodded at him encouragingly. "You did *my* job for me, you know. I can begin construction—and excavation—tomorrow. Without bothering to get a trucking permit, either."

Hopper's teeth showed. "The devil with the money! I'm going to teach this man a lesson! My time is worth plenty, and he's completely upset my schedule. Options, scouts—I've gone ahead on the assumption that he could do what I paid him for, and now he blandly thinks he can wiggle out. Well, Mr. Gallegher, you can't. You failed to observe that summons you were handed today, which makes you legally liable to certain penalties—and you're going to suffer them, Gammit!"

Smeith looked around. "But—I'll stand good for Mr. Gallegher. I'll reimburse—"

"No!" Hopper snapped.

"The man says no," Gallegher murmured. "It's just my heart's blood he wants. Malevolent little devil, isn't he?"

"You drunken idiot!" Hopper snarled. "Take him to the jail, officers. Now!"

"Don't worry, Mr. Gallegher," Smeith encouraged. "I'll have you out in no time. I can pull a few wires myself."

Gallegher's jaw dropped. He breathed hoarsely, in an asthmatic fashion, as he stared at Smeith, who drew back.

"Wires," Gallegher whispered. "And a . . . a stereoscopic screen that can be viewed from any angle. You said—wires!"

"Take him away," Hopper ordered brusquely.

Gallegher tried to wrench away from the officers holding him. "Wait a minute! One minute! I've got the answer now. It *must* be the answer. Hopper, I've done what you wanted—and you, too, commander. Let me go."

Hopper sneered and jerked his thumb toward the door. Narcissus walked forward, cat-footed. "Shall I break their heads, chief?" he inquired gently. "I like blood. It's a primary color."

Commander Wall put down his coffee cup and rose, his voice sounding crisp and metallic. "All right, officers. Let Mr. Gallegher go."

"Don't do it," Hopper insisted. "Who are you, anyway? A space captain!"

Wall's weathered cheeks darkened. He brought out a badge in a small leather case. "Commander Wall," he said. "Administrative Space Commission. You"—he pointed to Narcissus—"I'm deputizing you as a government agent, *pro tem*. If these officers don't release Mr. Gallegher in five seconds, go on and break their heads."

But that was unnecessary. The Space Commission was *big*. It had the government behind it, and local officials were, by comparison, small potatoes. The officers hastily released Gallegher and tried to look as though they'd never touched him.

Hopper seemed ready to explode. "By what right do you interfere with justice, commander?" he demanded.

"Right of priority. The government needs a device Mr. Gallegher has made for us. He deserved a hearing, at least."

"He does *not!*"

Wall eyed Hopper coldly. "I think he said, a few moments ago, that he had fulfilled your commission also."

"With that?" The big shot pointed to the machine. "Does that look like a stereoscopic screen?"

Gallegher said, "Get me an ultraviolet, Narcissus. Fluorescent." He went to the device, praying that his guess was right. But it had to be. There was no other possible answer. Extract nitrogen from dirt or rock, extract all gaseous content, and you have inert matter.

Gallegher touched the switch. The machine started to sing "St. James Infirmary." Commander Wall looked startled and slightly less sympathetic. Hopper snorted. Smeith ran to the window and ecstatically watched the long tentacles eat dirt, swirling madly in the moonlit pit below.

"The lamp, Narcissus."

It was already hooked up on an extension cord. Gallegher moved it slowly about the machine. Presently he had reached the grooved wheel at the extreme end, farthest from the window.

Something fluoresced.

It fluoresced blue—emerging from the little valve in the metal cylinder, winding about the grooved wheel, and piling in coils on the laboratory floor. Gallegher touched the switch; as the machine stopped, the valve snapped shut, cutting off the blue, cryptic thing that emerged from the cylinder. Gallegher picked up the coil. As he moved the light away, it vanished. He brought the lamp closer—it reappeared.

"Here you are, commander," he said. "Try it."

Wall squinted at the fluorescence. "Tensile strength?"

"Plenty," Gallegher said. "It has to be. Nonorganic, mineral content of solid earth, compacted and compressed into wire. Sure, it's got tensile strength. Only you couldn't support a ton weight with it."

Wall nodded. "Of course not. It would cut through steel like a thread through butter. Fine, Mr. Gallegher. We'll have to make tests—"

"Go ahead. It'll stand up. You can run this wire around corners all you want, from one end of a spaceship to another, and it'll never snap under strees. It's too thin. It won't—it can't—be strained unevenly, because it's too thin. A wire cable couldn't do it. You needed flexibility that wouldn't cancel tensile strength. The only possible answer was a thin, tough wire."

The commander grinned. That was enough.

"We'll have the routine tests," he said. "Need any money now, though? We'll advance anything you need, within reason—say up to ten thousand."

Hopper pushed forward. "I never ordered wire, Gallegher. So you haven't fulfilled my commission."

Gallegher didn't answer. He was adjusting his lamp. The wire changed from blue to yellow fluorescence, and then to red.

"This is your screen, wise guy," Gallegher said. "See the pretty colors?"

"Naturally I see them! I'm not blind. But—"

"Different colors, depending on how many angstroms I use. Thus. Red. Blue. Red again. Yellow. And when I turn off the lamp—"

The wire Wall still held became invisible.

Hopper closed his mouth with a snap. He leaned forward, cocking his head to one side.

Gallegher said, "The wire's got the same refractive index as air. I made it that way, on purpose." He had the grace to blush slightly. Oh, well—he could buy Gallegher Plus a drink later.

"On purpose?"

"You wanted a stereoscopic screen which could be viewed from any angle without optical distortion. And in color—that goes without saying, these days. Well, here it is."

Hopper breathed hard.

Gallegher beamed at him, "Take a box frame and string each square with this wire. Make a mesh screen. Do that on all four sides. String enough wires inside of the box. You have, in effect, an invisible cube, made of wire. All right. Use ultraviolet to project your film or your television, and you have patterns of fluorescence, depending on the angstrom strength patterns. In other words—a picture. A colored picture. A three-dimensional picture, because it's projected onto an invisible cube. And, finally, one that can be viewed from any angle without distortion, because it does more than give an optical illusion of stereoscopic vision—it's actually a three-dimensional picture. Catch?"

Hopper said feebly, "Yes. I understand. "You . . . why didn't you tell me this before?"

Gallegher changed the subject in haste. "I'd like some police protection, Commander Wall. A crook named Max Cuff has been trying to get his hooks on this machine. His thugs kidnaped me this afternoon, and—"

"Interfering with government business, eh?" Wall said grimly. "I know these jackpot politicians. Max Cuff won't trouble you any more—if I may use the visor?"

Smeith beamed at the prospect of Cuff getting it in the neck. Gallegher caught his eye. There was a pleasant, jovial gleam in it, and, somehow, it reminded Gallegher to offer his guests drinks. Even the commander accepted this time, turning from his finished visor call to take the glass Narcissus handed him.

"Your laboratory will be under guard," he told Gallegher. "So you'll have no further trouble."

He drank, stood up, and shook Gallegher's hand. "I must make my report. Good luck, and many thanks. We'll call you tomorrow."

He went out, after the two officers. Hopper, gulping his cocktail, said, "I ought to apologize. But it's all water under the bridge, eh, old man?"

"Yeah," Gallegher said. "You owe men some money."

"Trench will mail you the check. And . . . uh . . . and—" His voice died away.

"Something?"

"N-nothing," Hopper said, putting down his glass and turning green. "A little fresh air . . . urp!"

The door slammed behind him. Gallegher and Smeith eyed each other curiously.

"Odd," Smeith said.

"A visitation from heaven,

maybe," Gallegher surmised. "The mills of the gods—"

"I see Hopper's gone," Narcissus said, appearing with fresh drinks.

"Yeah. Why?"

"I thought he would. I gave him a Mickey Finn," the robot explained. "He never looked at me once. I'm not exactly vain, but a man so insensitive to beauty deserves a lesson. Now don't disturb me. I'm going into the kitchen and practice dancing, and you can get your own liquor out of the organ. You may come and watch if you like."

Narcissus spun out of the lab, his innards racing. Gallegher sighed.

"That's the way it goes," he said.

"What?"

"Oh, I dunno. Everything. I get, for example, orders for three entirely different things, and I get drunk and make a gadget that answers all three problems. My subconscious does things the easy way. Unfortunately, it's the hard way for me—after I sober up."

"Then why sober up?" Smeith asked cogently. "How does that liquor organ work?"

Gallegher demonstrated. "I feel lousy," he confided. "What I need is either a week's sleep, or else—"

"What?"

"A drink. Here's how. You know—one item still worries me."

"What, again?"

"The question of why that machine sings 'St. James Infirmary' when it's operating."

"It's a good song," Smeith said.

"Sure, but my subconscious works logically. Crazy logic, I'll admit. Nevertheless—"

"Here's how," Smeith said.

Gallegher relaxed. He was beginning to feel like himself again. A warm, rosy glow. There was money in the bank. The police had been called off. Max Cuff was, no doubt, suffering for his sins. And a heavy thumping announced that Narcissus was dancing in the kitchen.

It was past midnight when Gallegher choked on a drink and said, "Now I remember!"

"Swmpmf," Smeith said, startled. "Whatzat?"

"I feel like singing."

"So what?"

"Well, I feel like singing 'St. James Infirmary.'"

"Go right ahead," Smeith invited.

"But not alone," Gallegher amplified. "I *always* like to sing that when I get tight, but I figure it sounds best as a duet. Only I was alone when I was working on that machine."

"Ah?"

"I must have built in a recording play-back," Gallegher said, lost in a vast wonder at the mad resources and curious deviations of Gallegher Plus. "My goodness. A machine that performs four operations at once. It eats dirt, turns out a spaceship manual control, makes a stereoscopic nondistorting projection screen, and sings a duet with me. How strange it all seems."

Smeith considered. "You're a genius."

"That, of course. Hm-m-m."

Gallegher got up, turned on the machine, and returned to perch atop Bubbles. Smeith, fascinated by the spectacle, went to hang on the window sill and watch the flashing tentacles eat dirt. Invisible wire spun out along the grooved wheel. The calm of the night was shattered by the more or less melodious tones of the "St. James Infirmary."

Above the lugubrious voice of the machine rose a deeper bass, passionately exhorting someone unnamed to search the wild world over.

> "But you'll never find
> Another sweet ***ma-a-ahn*** like me."

Gallegher Plus was singing, too.

THE END.

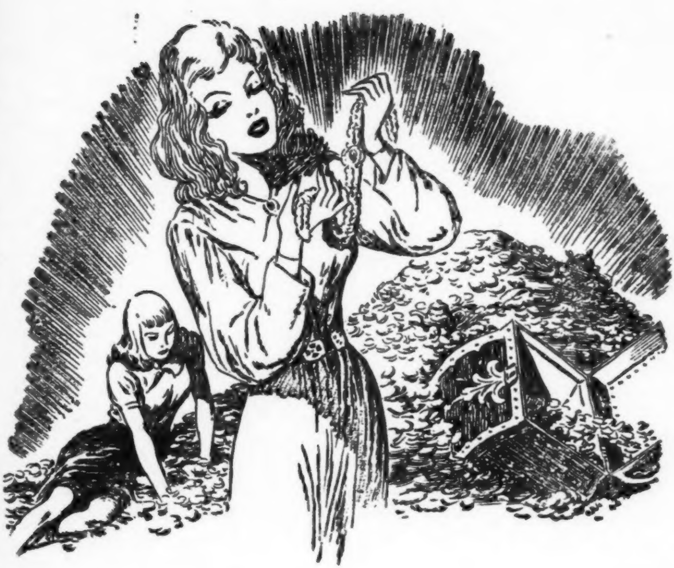
IN TIMES TO COME

If you remember E. M. Hull's "Competition," which appeared in the June issue, the Skal *thing* promised Artur Blord a favor. Hull has a sequel to that yarn coming up next month—"The Debt." It's a rather neat set-up—the Skal *thing* intends to destroy Blord which, considering the situation Blord has worked up, is reasonable enough. But Blord has that favor promised; he asks the Skal *thing* to destroy a ship—a ship Blord himself is piloting!

Timmins, our cover artist, had some fun illustrating that yarn, by the way. The story involves the use of an invisible spaceship. Timmins has illustrated that—and has the first scene, involving an invisible object, I've seen wherein the "invisible" object wasn't simply made glassily transparent. Timmins has accomplished the job strictly within the limits of the actual, necessary properties of a truly invisible spaceship, largely by some tricks of artistic composition. Very bad composition it is, too—in any ordinary scene!

George O. Smith is a radio designing engineer; he's got a yarn coming up next month that comes from the heart. Any technician who's tried to work from a "complete" instruction manual knows with a bitter certainty that such texts invariably leave out all the important data. In "Lost Art," Smith discusses the ancient Martian technique of—something or other. Like most manuals, the "complete" manual found in the Martian ruin neglected to explain what the purpose of the technology was. (Ever see a standard manual that explained what radio was intended for? RCA's excellent and elaborate "Receiving Tube Manual," for instance, doesn't so much as hint that a transmitting station somewhere is a great help to proper operation of a radio!) The discoverers of the manual—and the necessary tube to go with it—know it's a vastly important science. Only—what the heck is it?

THE EDITOR.



"—If You Can Get It"

by Murray Leinster

Illustrated by Orban

***The** formula was wonderful, and worked every time—unless someone said it couldn't! And working in that world was nice work—*

SOS! R.S.V.P.! Help! Aid! Assistance! Any bright mind in call, work out a solution for Stinky Selden and me, and write your own ticket! Any sum you care to name! Any future you feel like having! The sky is the limit—and how! This is an offer of the biggest reward in history, but it is strictly on the up and up. Anything you like, from a hogshead or two of jewelry to King Chosroe's harem, is yours if you solve our problem. There are no strings. No box tops to buy, and the only reasonable facsimile required is something like a way to get Stinky Selden back the knack he had just a little while ago. This is serious! No kidding! It's not only life and death, it's a lot more important than that! It's patriotism! It's—

Let me tell it to you from the beginning. You've got to know the problem, anyhow, before you start to work on the solution. The solution is bound to be simple. The only trouble is that Stinky can't think of it, and I've wrestled with it until I go around gibbering, and I can't get the answer. But I solemnly promise that Stinky and I will pay the biggest sum you can name in three breaths, or— Hell! You'll get an idea of what we can pay and what we're willing to do when you hear what it's all about.

It starts with the fact that I went to the Belmere Theater, in New Rochelle, New York, and saw Stinky Selden on the stage. I hadn't seen him or heard of him for six years—not since he dropped out of college in the last half of his senior year without any warning to anybody. I'd forgotten all about him. Stinky was easy to forget if he wasn't around.

But I remember him when I saw him again. He was up there on the stage, billed as a magician. This was his first show, apparently. He went around the stage, sweating visibly, with just about the stage presence of a sick hippopotamus. But he had the house paralyzed. He was a lulu. He was a knockout. He was terrific. He picked out a fat man in the audience—and no stooge, either, because I knew him—and pointed at him and the guy vanished from his seat in a flare of smoke, and then let out a howl not more than one second later—and he was up in a cage that had been dangling from the auditorium ceiling since before the show began. And he lifted the orchestra leader's head off and had it up on the stage beside him, and it sang while the orchestra leader's body went on conducting the musicians. And then—

Oh, all right. He did it with mirrors, or something. I won't argue. It was his first show, and his last, and it was just luck that I happened to catch it. I went around backstage and sent in my name and five minutes later a wild-eyed Stinky was greeting me, practically hysterical. He looked like he'd just had a terrific shock, and he babbled feverishly that it was swell seeing somebody he knew. He'd been away for six years, he said, and he'd been back two months and he was going off his nut and could he come and talk to me? He'd pay me for my time—

It all sounded screwy, to put the matter mildly. Anybody who'd seen that show would want to talk to Stinky and pump him about how he did it. But I took him up to my quarters. The idea of Stinky as a showman was a little bit grotesque, anyhow, because he is a big brute of a guy, weighing two hundred or over. He was too slow on the uptake to play football at school, and he was always rather much of a drip, and he was the last person in the world you'd expect to turn out a slight-of-hand expert who'd put Houdini in the shade. Certainly you'd never expect him to blubber quietly to himself in a taxicab. But he did. When you add that he has sandy hair, baby-blue eyes, no visible eyelashes or eyebrows, and that he is covered with large, ungainly freckles, you have the picture more or less sketched in.

"I guess I made pretty much of a spectacle of myself just now," he said miserably, when I had him in an easy-chair at my place with half a drink in him. "But I'll tell you, I'd counted on this show to fix things for me. And I'd just made the experiment and it didn't work and I was . . . well . . . pretty well broken up when they brought me your message."

"I don't know what you expected the show to do," I told him, "but my guess is that it did it. Magic acts are pretty old-time, but yours isn't! Your financial worries are over, anyhow. You can get any sort of booking—"

He shook his head mournfully and gulped the rest of his drink.

"I'm not interested in money just now," he said bitterly. "I've got plenty of that with me. But I didn't realize how used I've gotten to where I've been. And now I can't get back! This show tonight was my last hope, and I've just found out it was no good."

I stared at him. It didn't make sense, but after what I'd seen him do— None of what he'd done on the stage was even remotely possible. While he was doing his stuff he'd made two and two come out five and six, and next Thursday was up on the second floor next to the ladies' room, and black was red, and red was green. That was how I felt, anyhow, and if it isn't clear, come up to New Rochelle and ask somebody else who saw Stinky's show. Maybe they can make it clearer.

I poured out a second drink for Stinky and took a good swig out of my own. I was still a little bit dazed.

"Where have you been?" I asked. "Where's the place you want to get back to?"

"I haven't the least idea," said Stinky despairingly. His lips quivered like a little boy's. "That's the hell of it. But it was swell there!"

I waited a moment, and then I said:

"It must be swell, if you spend six years there and come back knowing how to do illusions like— Stinky, I know you prestidigitators don't like to tell your secrets, but how did you get that girdle off the fat woman in the box without her letting out a single yelp? I don't want to go in the business myself, but honestly—"

Stinky said in miserable self-contempt:

"Cheap stuff! I can't do the things I used to. What I did tonight is trivial. I've got to tell somebody," he suddenly said feverishly. "Maybe a fresh mind— If I tell you the truth, will you think I'm crazy?"

"Probably," I admitted, "but who cares? As I remember it, you were majoring in psychology in school. I've heard that stage illusions are applied psychology, but—"

"Listen," said Stinky, more feverishly still. "The place I've been is called Llanvabon, and all I know about it is that nobody'll believe in it. Not any more. I've got a picture in my pocket—"

He fumbled. Things spilled out of his pocket. Stinky is the world's clumsiest human being. Banknotes tumbled to the floor. They were the kind that you mention casually that you once held one of them, if you ever did. Yes. That size. There was a thick sheaf of them. But Stinky didn't pay any attention. He handed me a picture.

"You see those mountains?" he said hungrily. "That's the place. I went to some experts on mountains and asked where they were. They said that mountains don't grow like that. There aren't any such. But that's the place. If you ever saw them—"

I missed out for maybe a minute. I was looking at the picture. You see, there was a girl in the foreground, and it wasn't just a fancy picture. It was a very clear, very detailed picture. The girl was real. And we'll save time if you just assume that I've been incoherent for about ten minutes. She was like that. Maybe a little bit more so. I don't remember ever noticing the mountains.

Stinky's voice ran on jerkily when I really heard him again.

"It was a discovery that came out of my class work in psychology. Lindstrom, you know. On concept-action linkage. How you think that you want your finger to move, and it does. That stuff. You imagine the action, and it takes place. Nobody has ever been able to measure the energy used in thinking. The quantity's too small. But in one man's brain it can control and direct and release muscular energy up to a quarter of a horsepower for a short time. Sometimes even more. Lindstrom made a stab at the nature of that action, and how an immaterial thing like a concept can affect a material thing like a muscle. But he didn't get anywhere. I did."

I asked, very casually:

"Who's the girl in the picture?"

He bent over to look. I had the impossible conviction that he'd never noticed, before.

"I don't remember her name," he said. "She's just one of the girls around the place." He added, with a sort of stab of homesickness, "The girls there are—rather prettier than those I've seen since I came back. But I was telling you. I took Lindstrom's stuff, and added a bit from this theory, and another bit from that, and it added up to a theory that was all mine. I got rather excited. I had found out how a concept makes a muscle move. The actual linkage between a thought and a thing. And suddenly I saw that it could be applied to something besides muscular energy. There was a pattern of concepts that ought to control any sort of energy. If I thought in a certain way, I should be able to bend all sorts of energy to produce other results than moving my finger, but in just the same way. So I tried it. And I found out I could think out an electric light. Make it go out by thinking at it. You see?"

I was still looking at the picture.

"Remarkable," I said calmly. "Er, this girl in the picture. Is she married or engaged or any little thing like that?"

"Of course not," said Stinky, as if surprised. "She's one of my secretaries." Then he went on with a nostalgic air, "Let me tell you what happened. It was fascinating, being able to make an electric light go out by thinking at it. It was really a—well, a scientific discovery of the first order. I tried to show it to Professor Bolton. I explained the theory to him, and said I could think an electric light out, and he told me I was cracked. So I tried to—and I couldn't!"

"I remember Professor Bolton," I said. "Even for a professor of psychology he was unusually a drip."

"Are you telling me?" asked Stinky cheerlessly. "Wait! But he did lead me to the next stage of my work. You see, I'd found a trick way of thinking that took all sorts of energy—electric energy, heat energy, solar energy, anything!—and controlled it just like you ordinarily control muscular energy. But he'd stymied it. In fact, when I was off by myself, I couldn't even put out an electric light again. Which was interesting, too."

"You did a trick tonight that interested me," I said irrelevantly. "When you walked down the center aisle, just looking from side to side, and then climbed up on the stage and pulled a pair of silk panties with black lace on them out of thin air. You remember? You asked the owner to come forward and claim them, and a blonde in the eighth row grabbed at herself and fainted. Really, Stinky—"

Stinky looked embarrassed.

"I was upset at the moment," he said defensively. "That was a case just like I'm trying to tell you about. Like the time when I couldn't think out an electric light, though I'd been able to do it before. That puzzled me. So I tried something else. I stuck a cigarette in my mouth and tried my trick concept-pattern on it to make it light. And it did. You see what it meant?"

"Panties?"

"Be serious!" said Stinky imploringly. "It meant that if I tried to do something that nobody had tried to do before, I could do it. Nobody had tried to think an electric light out before. So I could. But if anybody had ever decided a thing was impossible, I couldn't do it. When I told Professor Bolton what I could do, he immediately denied it. So—it was impossible."

"I thought it over, in words of one syllable. Stinky went on painstakingly:

"Anything anybody thought was impossible, was impossible. I couldn't make myself a drink, because too many people had had that idea. I couldn't make a million dollars. But nobody before me'd had the idea of a red, white, and blue turkey with a straw hat on, walking into chapel in front of him. So nobody'd decided that it was impossible and—"

I sat up straight.

"I remember that turkey!" I said.

"Yes," said Stinky morosely. "It was one of my experiments. It raised hell. The dean talked about the infantile sense of humor of a barbaric mind. I—guess I'm not very bright in some ways. Tonight, walking up the aisle, I'd tried three things in succession, and somebody'd thought of each one and decided that they couldn't be done. So it looked like my show was going to be a flop, and in desperation I thought of that panty thing, and nobody'd imagined me unable to do it, so I was able to."

"Yes," I agreed. "You were able to!"

Stinky looked at me imploringly.

"Do you see the fix I'm in? It's just like back at school, when I'd made one of the greatest scientific discoveries in history—and couldn't do a thing with it! I couldn't even prove it, because when I stated a test case somebody'd be skeptical, and that made it impossible! And my discovery was important! It was damned important! It needed to be worked out!"

I sneaked another look at the picture Stinky had handed me. That girl in it was really—

"I gather that you worked it out," I observed, "but that it doesn't work any more. Still, when you made all those unsuspected toupees rise up in the air from here and there in the audience, and fly in combat formations and stage dog fights in midair—"

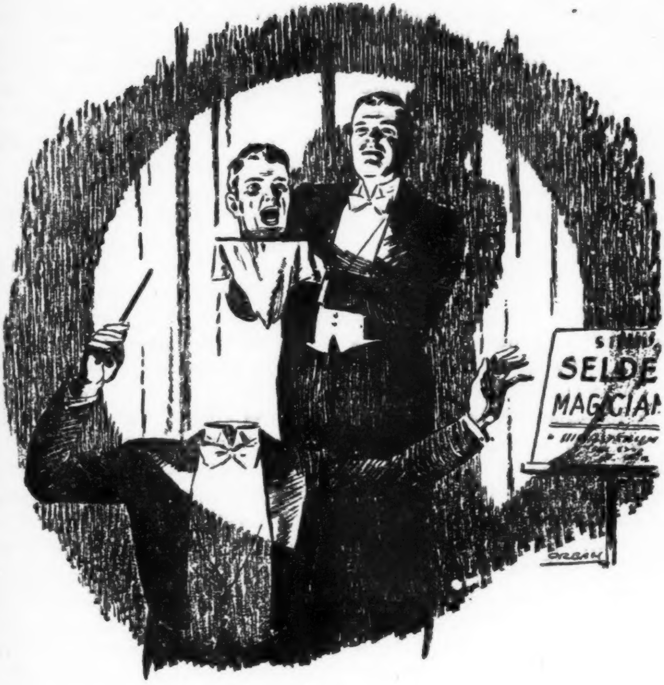
"I was billed as a magician," he explained miserably, "and people expected me to make them see unusual things. They didn't deny that I could make them see things they'd never seen before—so I could. But, if I'd told them in advance about any one trick, somebody would have said to himself that I couldn't do it —and I wouldn't have been able to! Oh, I was a fool to come back! It's all my damned scientific conscientiousness—"

Stinky looked suicidally morose. He'd been practically hysterical when I picked him up, and he'd had three drinks, but he didn't look a bit more cheerful.

"Give, Stinky," I said. "Maybe I'll wake up and find I dreamed all this, but right now I'm listening."

Stinky said gloomily:

"I've told you this much to see if a fresh viewpoint will straighten my problem out, so I might as well



finish. Back at school there, I tried to think the thing out, and I found a solution by accident. To work out the scientific rules of the discovery I'd made, I needed to go to some place where the test conditions would be under control. If I had to think up something brand-new—that nobody else had ever wanted to do—for every test of my concept-pattern, I couldn't possibly work it out. I had to have a clear field for experimentation."

I made a brilliant guess.

"Llanvabon?"

"I didn't know what it was then," he told me. "I was discouraged. Trying to experiment in the dormitory at school, I found that somebody had thought of almost everything! I did manage one or two things, but I couldn't do anything scientific! And one night I got to picturing to myself a place in which I could work. A place with no inhibitions."

"Eh?" I asked, startled.

"Nobody'd believe that there was anything that couldn't be done," said Stinky, with a homesick look in his eyes. "Nobody'd deny that I could do whatever I liked. They might think I was a magician, or something, and take it for granted that I could do anything I chose—and they'd approve of my trying things. In a place like that I really could find out what my discovery of a concept-pattern for the control of energy meant. You see?"

I didn't say anything. Not a word.

"I was so discouraged," he went on nostalgically, "that I pictured a sort of paradise for a guy like myself. A swell laboratory of sorts, and—well—since I'd be thought of as a magician, the sort of equipment a magician would have, a tall castle on a craggy peak, and— Oh, it was childish, probably, but I was discouraged. I'd made one of the greatest scientific discoveries of all time, and all I could do with it was make red-white-and-blue turkeys walk into chapel. So I let myself go, feeling blue and picturing the sort of place where a guy like myself could do his stuff. And just as I was coming to the end of the daydream, it occurred to me that it wasn't likely that anybody else had ever wished for a place in which to do experiments with concept-patterns. It could be an experiment in itself. So I gathered myself together and very carefully framed my concept-pattern to draw on all the energy there was to put myself in just such a place."

Stinky sighed. And if you think you've seen somebody looking gloomy, you should have seen Stinky at just that moment, sitting in my best armchair with a drink spilling on his trousers. He made Niobe look like a plastered lady poetess by comparison. He fairly dripped dejection. If you'd looked at him, you'd have felt that it would be only hospitable to offer him something to cut his throat with.

"Well?" I demanded. "What happened?"

"I stayed there six years," said Stinky with a sort of miserable satisfaction. "It was swell, really. And, of course, I could experment to my heart's content. I found out a lot more about concept-energy linkage. I got them down so they were practically automatic. Everything was ideal. I got my book written—"

"Book?" I asked, startled. "What book?"

"The book about my discovery," said Stinky. "What's the use of making a scientific discovery if you don't publish?" Then he added guiltily: "It shouldn't have taken me so long to write it, but I didn't realize. I was dictating it, you know, and I hate homely girls, but somehow if I started to dictate it to somebody who was good-looking we'd get to talking about something else, and sooner or later—" He looked embarrassed. "Of course, after you've gotten romantic with a girl there's no use trying to dictate a text on psychology to her, so I kept changing around, and not getting anywhere—with the book, that is—and, well, I had a lot of trouble until I remembered dictaphones. When I started dictating it onto a record I made out all right. But I haven't found a publisher for it yet."

"I'd give a great deal," I said significantly, "to understand the social system of Llanvabon."

"There isn't much of one," said Stinky hurriedly. "It was sort of silly, the way I started thinking of it, and I never got around to changing it. I've got this sort of castle that's my lab, and the people think I'm a magician so I have some guards around for the looks of the thing, and . . . er . . . the people are sort of oriental, and they wouldn't understand it if I didn't do myself well—"

"Including secretaries," I said in studied calm.

Stinky blushed, and wriggled, and said defensively:

"They expect it, and after all—"

"That girl in the picture," I said sternly. "She—"

"She's the one I got to type from the dictaphone records," said Stinky. "I wanted to get the book finished, so I made rather a point of not . . . er . . . having any social contacts with her. I don't think she liked it. She sent back one of the records with a note saying she thought she could do better, if I dictated direct, but after all—"

I said:

"Stinky, the trouble with you is that you are a scientist, with no ideas of organization. In this Llanvabon you can make all the money you want, can't you?"

"Of course," said Stinky, in morosely pleasant retrospection. "For fun, one day, I made myself the sort of treasure hoard a magician ought to have. I think I got the idea from Mowgli—howdahs and palanquins and spilled coins, and so on. It's funny how girls like to dig around in there and find necklaces and things—"

"The thing you need," I said firmly, "is a business manager. Now, if you took me back there with you, and especially if you gave me that girl in the picture for a secretary—I'd be quite willing to dictate direct, I think."

"It would be swell," said Stinky hopelessly. "I'd like to have you take care of some things for me. I could give you a wing of the castle and let you pick out your own staff. I sort of went overboard on secretaries at the beginning, and the place is rather cluttered up with girls I used to be romantic with. But there are plenty I haven't gotten around to—" Then he added hastily: "I'd give you a couple of tons of treasure a month and you could work out practical things for me. But don't you see?"

"See what?"

Tears welled into Stinky's eyes.

"I can't get back! I can do tricks here—if nobody's ever wanted to do them and decided they can't be done. But I can't get back! When I'd finished my book, I came on back here to arrange for its publication. And

I went over to the school, and Professor Bolton was still there, and I explained that I'd been off experimenting and wanted to prove to him that I hadn't been wacky, six years ago. And I did a couple of tricks and he said acidly that he was astonished that I should take up his time with such nonsense, because it was impossible for me to do those things except by sleight of hand, which wasn't science but charlatanry."

For a moment there was silence. Stinky sank into a slough of despond. Then I said:

"Oh! And then you couldn't do them except by sleight of hand!"

"Right!" said Stinky bitterly. "I should have taken warning. But I got mad. I said that with my discovery I'd traveled to places where every fool was wiser than he was. And he looked at me with that nasty superior smile and said that he suggested I use my discovery and travel out of his sight right then. And, of course, he believed it was impossible for me to travel anywhere with my concept-pattern. And so it was impossible!"

Stinky's lip quivered. He was big enough nearly to overflow my armchair, but he was ready to cry like a baby.

"I did think I had it all set tonight," he quavered. "I thought I'd get that theaterful of people believing I could do absolutely anything I wanted, and they'd neutralize Professor Bolton's disbelief and I could get back to Llanvabon. It's such a s-swell place to live! I'm homesick for it! I"—he gulped noisily—"I thought I was going h-home tonight and it didn't work! w-want to g-go h-home and—just live quietly as a m-magician in my castle with m-my secretaries and my b-books—"

He blubbered. He is sandy-haired and blue-eyed, with no visible eyelashes or eyebrows, and he has large, ungainly freckles, and he weighs two hundred pounds. But —well—

I said briskly:

"All right, Stinky. I'll fix it up for you. What your problem needs is a fresh approach. I'll have a new viewpoint, and I'll figure out something to cancel Professor Bolton's jinx. You know there's another reason for getting back this little knack of yours. If you're patriotic—"

"If I could g-get back," said Stinky, blubbering, "I could win the war for our side in a month. Don't you think that's on my mind? B-but somebody's thought of almost everything, here, and wished they could do it to the Japs and Hitler. But back in Llanvabon where nobody's decided that anything impossible—"

You see? It's all set. All but one little thing. Professor Bolton doesn't believe that Stinky can travel anywhere just by forming a concept-pattern in his mind that controls all sorts of energies, as a concept controls the muscles of a man's body. And since Professor Bolton denies it, Stinky can't do it. That's the problem. It looks simple, and I thought I could lick it, but I can't. I've spent weeks on it, and I've gotten thin, and I go around practically ready to bite myself in the back of the neck. But there's bound to be a solution, and it's bound to be simple. Maybe you can figure it out.

Stinky's doing what he can, of course. Remember that ace aviator who vanished and was found after he'd been gone an impossible length of time? Remember— No. I'd better not tell you anything else. You might start wishing Stinky'd do this or that—and feel sorry that it wasn't possible. Don't! Stinky's hampered enough right now because so many people are thinking of things they wish would happen, and then deciding that they can't. Stinky has to work out entirely new stuff while he's here. But of course, if he can get back to Llanvabon where nobody thinks anything is impossible, he can do anything at all.

He's patriotic, but he's homesick and beginning to feel utterly futile. I'm afraid he'll crack. The other day he pointed out that nobody could possibly have denied that he could still do things in Llanvabon. So there's a swell castle all ready for me, with a teletype machine printing war news as fast as it happens, and a big map room to plan out what he's to do, and loads and loads of secretaries. And as soon as I solve the problem— He means it as an added incentive. I don't need it. But this is the best I've been able to do to date:

SOS! R. S. V. P.! Help! Aid! Assistance! Any bright mind in call, work out a solution for Stinky Selden and me, and write your own ticket! Anything you like, from a couple of hogsheads of jewelry to King Chosroe's harem, is yours if you figure out a way to get back the knack that Stinky had a little while ago. It's life and death! It's patriotism! Write, wire, or telephone. Put your brains to work! I'm dizzy with trying to figure it out, but it's bound to be simple! SOS! R. S. V. P.! Help!

THE END.

Turn on The Moon

Continued from page 107

sky. In a picture that thousands of navigators and amateur astronomers would make a special point of seeing, a howl of protest would undoubtedly arise if the dome opened revealing a nondescript bunch of stars they had never seen before. For these newly created navigators and amateur astronomers would be far more harsh in their criticism than the professional astronomers, who would be more likely to regard any technical errors with good-natured tolerance. Besides, there aren't enough professional astronomers to matter, anyhow.

On the other hand, the art department, while anxious to make the starry heavens an inspiration and a joy forever, were up against certain formidable difficulties. A star in the sky is a point of light. But a star on a backdrop necessarily is a distinct disk. The result was that the brighter stars looked more like white buttons than twinkling points of light.

Another inherent difficulty which it seems impossible to avoid is that real stars are essentially at infinity, while artificial stars are only a few feet from the camera. Whenever the camera moves or "pans" from one point of view to another the constellations often undergo alarming changes in position with respect to the rest of the scenery. These changes were often so startling in character as to raise the question of whether it might be better to use frankly imaginary constellations rather than to send such well-known figures as the Big Dipper into weird contortions.

As matters now stand, the plan is to make the constellations authentic in the longest scene of the night sky and use imaginary stars elsewhere. It was felt that star gazers should be satisfied with one good look at old familiar constellations such as the Big Dipper, Cassiopeia, and Auriga; while only a few experts who specialize in comet hunting could readily identify such regions as Hydra, Camelopardalis, or Cetus that contain no well-marked geometrical star patterns.

As usual, the moon provided plenty of trouble. Several minutes might be required to determine whether the Big Dipper should be lying down or hanging by the handle, but any alert amateur could tell instantly whether the moon was at the right phase in the right part of the sky.

Lunar errors are notorious, of course. Stars inside the crescent, moons with the illuminated side turned away from the sun instead of toward it, are among the most common that give astronomers ulcer of the stomach.

In "The Heavenly Body" the trouble arose over trying to observe the crescent moon with a telescope that could point in only one direction.

The studio felt there were several points in favor of having the comet collide with a crescent moon. It was felt that even Judy, the name applied to that hypothetical dumbest person in the audience, could hardly mistake a bright crescent in the night sky for a Japanese pursuit plane or a parachute trooper, or in fact anything else in the world but the crescent moon. Also, by having the comet strike the large dark unilluminated portion the bright flashes could be made to show momentarily glimpses of the dead mountains and craters—a scene with tremendous spectacular possibilities.

Now the set on the studio consisted of the lower section of a reflecting telescope mounted like the 200-inch but on the scale of the 100-inch. It had cost twenty-five thousand dollars to build, and if it were not for the war-time ceiling would undoubtedly have gone to fifty thousand dollars. The telescope was fixed in position incapable of motion except for a little swing north and south.

Any amateur telescope maker or astronomer knows that a telescope mounted equatorially so as to follow the stars across the sky from east to west must have its polar axis parallel to the earth's axis of rotation. That is, the polar axis—which can be identified at once from a single glance at the instrument—must point toward the north celestial pole for an observatory in the northern hemisphere. Thus there cannot be the slightest doubt in the scene which way is north, south, east and west.

The script calls for the telescope to be turned upon a crescent moon in the early evening. But a crescent moon in the early evening must be *in the west*. And the set was built rigid and immovable with the telescope pointing directly *east!*

Since the telescope could only be changed at great delay and expense, it became necessary to try to do something with the moon. Two solutions were possible. The time could be switched to early morning when a crescent moon could be made available in the east. Since this would have required major alterations in the script, over half of which had been shot already, this was definitely ruled out. The only other solution was to change the phase of the moon from crescent to gibbous.

This sounded like an easy way out of the dilemma to me, but to my surprise no one ever seemed to have heard of a gibbous moon before. I supposed anyone who knew his Sherlock Holmes would be thoroughly familiar with gibbous moons. Conan Doyle invariably lit his exteriors with a gibbous moon between full and last quarter. Writers of mystery books have followed in the footsteps of the master, so that it is rare indeed to read of a murder committed out on the lonely, desolate moor without the illumination being supplied from the pale radiance of a ragged, gibbous moon.

After discussing the matter from all angles, it was decided to change the phase from crescent to one a little fatter than first quarter. This still is not strictly correct, for such a moon would be almost straight south instead of southeast. But the error is too slight for any except a few astronomical purists to object seriously.

Not until you become a technical adviser do you begin to realize how poorly you have observed the surroundings in which you thought yourself thoroughly familiar. One of the scenes in the observatory shows the night assistant at the control desk of the telescope pressing buttons that operate the various instruments. This control desk was modeled directly from the one in the 100-inch dome at Mount Wilson. There are two clocks above the desk: an ordinary clock that keeps Pacific War Time, and a sidereal clock. The sidereal clock shows the time according to the stars and gains four minutes a day on the ordinary clock. In the studio scene it was obvious that both were run by alternating current.

While the scene was being filmed the question suddenly occurred to me: would a sidereal clock run on alternating current? I tried to visualize the control desk in the 100-inch dome on Mount Wilson. Was the sidereal clock there run on A. C. or by pendulum? No amount of concentration could tell me what kind of a clock it was, although I must have seen it hundreds of times.

While I could see no valid reason why a sidereal clock could not be made to run on A. C., the question got to worrying me so much that I had to settle it by calling Mount Wilson on long distance. Yes, the sidereal clock was run on A. C. by means of special gears ground to allow for that four-minute difference in time.

The thought that a momentary slip on your part may necessitate retaking a scene at the cost of tens of thousands of dollars is one reason why being a technical adviser is not quite the sinecure it seems. The script girl, whose job it is to check continually on such details as the actors' clothes, the time of day, the objects in the room, et cetera, told me she had had two nervous breakdowns through inability to leave her work behind at the studio.

Another disquieting experience is the way you can look straight at a technical error without ever seeing it. On the control desk mentioned previously, there had been built two sets of buttons supposed to be punched in moving the telescope east and west, north and south. These two sets of buttons had been labeled YOLK and TUBE.

Now to be correct they should have been marked R. A. (right ascension), which refers to the motion of the telescope east and west; and declination, or DEC., which refers to the motion of the telescope north and south. But since the top of the desk would scarcely show in the scene it hardly seemed worthwhile to make the change.

Then someone noticed that while the central yellow part of an egg was spelled Y-O-L-K, this part of the mounting of a telescope was spelled Y-O-K-E. Needless to say, these words were painted out and replaced with the correct designations of R. A. and DEC.

After a month of watching a picture in the making I have come to the conclusion that you should never accept anything you see upon the screen as strictly bona fide. Studio technicians have more ways of "cheating for the camera," as they call it, than Jupiter has moons. For example, Mr. Powell has a scene in which he is shown ascending in an elevator from a position near the floor of the observatory to the Newtonian focus of the telescope near the upper end of the tube. The shutter, ladder, and stars appear to sink below as he is carried upward toward the top of the dome. In reality, he stands still while a moving picture of the shutter, ladder, and stars flicker past on a screen behind him. When the scene is photographed from in front the camera is adjusted so as to synchronize precisely with the one from behind that forms the background. When seen in its final form the flicker is completely eliminated and the deception almost impossible to detect.

Another trick which is twenty years old but apparently not so generally known as the process shot just described is one called a Newcomb shot. As can be seen from the accompanying photograph, only the lower portion of the observatory dome was constructed. This was photographed with a still camera, care being taken to block out the outline of the upper part of the set. Then artists draw in a dome for the observatory that matches the outline so closely that the illusion is nearly perfect unless you are very much on the alert for it.

Often a background is needed where there is no motion. This is supplied merely by projecting the scene onto a screen by means of an ordinary lantern slide. A difficulty that sometimes arises here is from the water-cooling bath in which the slide is immersed to keep it from cracking due to the intense heat of the light source. Any little impurity in the water will be enormously magnified on the screen. Thus the leading lady might be seen gazing over her balcony across the white cliffs of Dover when what looks like a baseball comes suddenly shooting up out of the English Channel. Although they use only the purest of distilled water, these troublesome specks will occasionally ruin an otherwise perfect scene.

Working ten hours a day within the confines of a studio sound stage for weeks and months, your attention gradually becomes centered upon the scenes and characters portrayed there to the exclusion of everything else, until illusion and reality blend imperceptibly together. Those walls that look so substantial can be quickly shoved aside to shoot the scene from a different angle. The papers and books on the astronomer's desk would prove a decided surprise if the camera ever got close enough so that you could read the print upon them. The distinguished-looking group of astronomers over there apparently discussing the abstruse problems of relativistic cosmology are just a bunch of extras wondering if they will get an eight- or ten-o'clock call tomorrow morning. The trees and grass were put there by the studio green man. The stars twinkle because a couple of grips are frantically shaking a screen in front of the electric-light bulbs that produce them. The heroine is lost and in danger—except that a few feet away are the director, assistant director, four cameramen, the script girl, two make-up men, a dramatic coach, four sound technicians, about twenty grips and gaffers, and a technical adviser over in the corner trying to keep out of the way.

It might be supposed that going from the quiet of a pure research institution such as an astronomical observatory to the bustle of a gigantic motion-picture studio such as MGM would be like jumping from Pluto to Mercury. On the contrary, after a little while you discover the two surprisingly similar in many respects. In the motion-picture studio they want the best pictures of the stars they can get, which is precisely what an astronomer is after. After you get to know them you find the people aren't so different, either. They even complain about their work in the same way. Astronomers are prone to bemoan their antiquated equipment, the old-fashioned clock drive, the awkward darkroom. "Now when the 200-inch is completed—"

In a motion-picture studio you can hear the same story told in nearly the same language. Take that boom over there, for example. You need a crew of six men to push the thing around, the camera isn't steady, the wiring is all wrong. "Now over at Cosmic Pictures—"

When I first stepped through the studio gates I expected to find a new world, inhabited by strange beings who spoke a different language and had different customs from those I had known. Yet I found it all very much the same as the world I had always known.

Perhaps when man goes to Mars, his biggest surprise will be to find a world as familiar as the old one he left forty million miles to sunward.

THE END.

Brass Tacks

Well, did C. L. Moore's story come up to expectations?

Dear Mr. Campbell:

The July, 1943, issue of Astounding does no "history making," as some July issues have, but it is none the less a distinct improvement after your recent ebb-tide period. The boys are getting into the groove again. You will keep them there, won't you?

Because it does represent an improvement, therefore, I will refrain from comparison with other July issues in the dear dead past—e. g., "Dangerous Dimension," "Greater Than Gods," "Coventry," "We Also Walk Dogs," "Tools," and such serials as "The Legion of Time," and "Methuselah's Children"—and judge it solely on its own merits. Based on those, it stands up very well indeed—and *c'est la guerre,* you know.

Let's pass over the art work hurriedly, shall we? That topic has been cussed and discussed so often that any more remarks would just create bad feeling. The fans will simply have to put up with these quaint little sketches until the "regulars" come home. You have a good cover artist, and we'll forgive one slight slip.

The departments sparkle as usual; no comment needed.

And thus we come to Richardson's article. There have been more interesting articles than this—interesting in the manner of the writing, not the subject matter. There have been more significant articles—a few of them. There have been articles which packed in more facts. But for a combination of interest, fact and significance, all rolled into one, this one tops everything since Van Dresser's "Introduction to a Nameless Science." That's going some. Whatever you do, don't lose Richardson.

And now the stories. The longer material continues to be your best, as we shall see:

"Gather, Darkness!" was all we expected it to be and a little more. The Fanatic unveiling came as a most unexpected surprise; in fact, this story's charm lies partly in the variety of surprises it encompasses. But more than that, Leiber has created a set of characters that really stick in the memory. Goniface, the Black Man, Brother Chulian, Mother Jujy, Brother Dhomas, Cousin Deth, the familiars, Jarles—I imagine that the specific names will linger in the mind far longer than most of them do. It's really a pity to have to take leave of these very real people. Such a pity that I am tempted to ask for a sequel. Have a heart, Mr. Campbell, and don't leave the Black Man in the lurch. Poor guy, he deserves some reward.

Treading on Fritz Leiber's heels is A. E. van Vogt with "The Great Engine." Ten to one this story starts an argument as to the fundamental rightness or wrongness of colonizing Venus in this manner; also to the ethics of keeping an invention suppressed in the manner described. A little out of A. E.'s usual line, but I believe that's a good thing—he needed a rest from the usual supergalactic line he dishes out. We'll expect his next "super-yarn" to be better than ever because of this little rest cure.

And in third place is old faithful Clifford Simak, with his clever tale "Hunch." (My, how you do love one-word titles, though.) There's nothing especially unusual about this story—the asteroid-gems idea is old, and Hannibal reminds one of a Fritz Leiber "familiar"—but the tale is very, very well done. I hope Simak is one author who'll be able to stick with you; he and van Vogt make a pretty good "backbone" for the magazine to lean on.

The three shorts follow, in any order. They're all good, clever pieces of writing, but none of them is worthy of any special mention.

At this point the roving eye lights upon the announcement re "Judgment Night." A two-part serial by C. L. Moore? Ah, joy complete! Brother Stoy, 'twould seem, has the right idea about serials. One good thing about the war is that we will probably hear a lot more from Miss Moore now. Am I right?

Which covers the issue. Keep 'em flying, Mr. Campbell, and we'll be waiting anxiously for those post-war "super issues" you've been talking about.—Paul Carter, 156 University Street, Blackfoot, Idaho.

That wasn't Cyrille they were destroying—that was the whole of man's universe. One of the neatest pieces of symbolism I've seen.

Dear Mr. Campbell:

All the hopes I had for "Judgment Night" have been realized, the second installment being, if anything, even more powerful than the first. Technically, the story is almost perfect; presenting us with a surprise ending—several of them, in fact—without distorting the unity of the whole story took some doing. Artistically, Miss Moore leaves us very little to be desired, occasionally giving the redoubtable Mr. Merritt a run for his money. Characterization is splendid—it is now evident that the blurred-over effect of the first part in this respect was intentional, to prevent the revelation of the plot. The account of Cyrille's destruction is one of the most gripping things seen in a good many months in this magazine, even though stirring up a little resentment that the wonderful pleasure world must be done away with after such a brief acquaintance. And the ending was quite final and satisfactory.

It is to be concluded, therefore, that "Judgment Night" is, thus far, the best story to appear in Astounding in 1943. You have three months to top it in; think you can do it?

One might expect the rest of the issue to appear rather pale after Miss Moore's opus—but first let us note that there are some very interesting names on the contents page. Very interesting indeed. There is that most excellent and worthy writer, Mr. Hal Clement. There is Ray Bradbury, one of the best recruits from the fan ranks. There is Mr. Holmes, author of "Rocket To The Morgue." And last, but certainly not least, good old van Vogt, one of those rare individuals who can turn out something just about every month of the year and still call nine tenths of his stories exceptional—some of them a little more than that. Perhaps Miss Moore will not be all alone, in spite of everything.

The author that comes the closest to sharing the pedestal with her is Hal Clement. "Attitude" is typical of him, which means that it is a very clever, carefully plotted, and supremely logical piece of work, an outstanding novelette that takes a good, strong second place. Clement seems to have replaced Rocklynne as your "problem boy"—not in the sense of writing quality, but of story type. More in this vein, please.

The three shorts trail, as shorts have had a habit of doing in recent months. Undoubtedly the best written is van Vogt's "Concealment," but—am I just thick-headed, or has A. E.'s obscurity finally mastered him? If he had explained a point or two about the superman massacre, et cetera, all would be lovely, but—chopped off as it is, "it makes nuts!" Bradbury's little fantasy is quaint, hardly stf; if he'd laid the story in a modern setting rather than the future, and slanted the yarn for *Unknown Worlds,* he could have given us an excellent yarn in the "shop tradition" (cf. "Shottle Bop," et cetera). As it is—good, but vaguely unsatisfying. Holmes' "Robinc," along with "Q. U. R.," might well have been incorporated into an excellent novel, but the new effort by its lonesome has that "sequel letdown."

The saga of the VfR, as pictured by Ley, ought to receive special mention; for actual worth, I'd rank it next to Clement's yarn. A small beginning, perhaps, but you'd be surprised how many nonreaders of stf. don't realize that even this much progress has been made in rocketry. Here's something with which to wake a few of them up.

Probability Zero; first place goes to David Charles' inside story of the market crash. Second to Bradbury's little tale, and third to Smith's remarkable voodoo psychodynamics, which, if we may believe the headlines, have already taken effect. Followers of the Smith plan are advised to purchase three new pincushions, for Messrs. Goering, Doenitz, and Keitel.

Aside to Mr. H. H. Holmes: here, here, sir, cease temporizing. Cease writing your little short stories and commence the epic which all readers of "Rocket To The Morgue" are waiting for. I refer, of course, to "The Life and Times of Garth Derringer." Surely, if Dr. Derringer is to science-fiction as Sherlock Holmes is to whodunits, as your book implies, he deserves commemoration by someone other than the mythical "Fowler Foulkes."—Paul Carter, Chatham, Massachusetts.

Fellow sufferer?

Mr. Caleb Northrup,
c/o Brass Tacks.

Dear Mr. Northrup:

Your description of why it takes ten years to develop anything new and different would be darned funny if it were not so true. No doubt you could go on and on until several thousand words were run up and a bit of human interest included; at which time people would read it and say: "Wonderful story, but, of course, it couldn't happen!"

When we get the armed guards and the "Restricted Area" signs out of Venus Equilateral, we will issue you a formal invitation to visit us, but at the present time we are beset by the same kind of hazards, obstructions, and last-minute furor. At that time we shall enjoy an experience-swapping session that should prove interesting, since you obviously are no stranger to the hectic life yourself. If nothing else, we may be able to cry in one another's Scotch!

So whether it be rockets, captive balloons, or box kites, we'll have to dust out the bugs and Keep 'Em Flying!—George O. Smith.

Proving one thing definitely, anyway: Astounding readers have the "research mentality"!

Dear Mr. Campbell:

Congratulations for those ten years: October, 1933, to October, 1943. That's going some, Astounding—a record, if you please!

How about a little review? Ten years in nostalgic retrospect. What were the outstanding stories? The favorite authors? The best-liked artists, covers, articles?

This "Analytical Lab" is going to be strictly impersonal. It represents the collective voice of one thousand three hundred sixty Brass Tackers—over the ten-year stretch—that have aired their opinions in the magazine. Each vote in each and every letter was carefully noted and tabulated. A vote or point is given each story described as excellent, splendid, or top for the month. When the story is rated one of the yearly ten, or an all-time choice, it gets two and one half points. On the other hand, a disparaging opinion drops the item a peg.

Which reminds one of the advice that it requires five hundred on the poll to adequately sketch even a year in review. Admitting that we can't get around to that, keep an eye on how statistics available *do* highlight those old favorites:

A decade of Street & Smith Astounding has produced (approximately):

950	serials, novels, novelettes, and shorts
200	authors
29	interior artists
15	cover artists
1400	sharp and blunt, bright and dull Brass Tacks

Leading off with the first of the "thought variants," "Ancestral Voices," by Schachner, in 1933, Astounding, took immediate command of S-Fandom's army—in January, 1934, with the greatest of the T-V's, "Colossus," by Wandrei!

Brass Tack survey for 1934 rates the year's best:

	Points
1. Legion of Space (Williamson)	131
2. Skylark of Valeron (Smith)	120
3. Rebirth (McClary)	108
4. Colossus (Wandrei) ties with Old Faithful (Gallun)	61
5. Twilight (Stuart)	50
6. Lo! (Fort)	43
7. Bright Illusion (Moore)	40
8. Sidewise in Time (Leinster) ties with He From Procyon (Schachner)	30
9. Spoor of the Bat (Zagat) ties with Before Earth Came (Fearn)	28
10. Colossus Eternal (Wandrei) ties with Born of the Sun (Williamson)	22

During 1934, Astounding procured the best of the current S-F authors; and featured one hundred sixty pages for the first time in S-Fandom. Plus introducing the incomparable Elliot Dold. Remember his "powerful" artistic creations for "Skylark" and the December issue?

The S-First Ten for 1934 gave us fourteen classics, even-ties included. And for the following year the record shows that down to 22 points there were fourteen again. But this time Mr. Campbell's "The Mightiest Machine" leads off with 94 points. Second place goes to Stuart's "Night" and Gallun's "Son of Old Faithful," tied at 32. (Quite a drop from 1934's second place, and third, 100+ numbers!) But, of course, everyone knows that 1935 Astounding produced more "favorites" than its competitor's whole decade! The year gave us Stanley Weinbaum at his best in "The Red Peri" (28) and his four other leaders: "The Lotus Eaters," "Parasite Planet," "The Mad Moon," and "The Adaptive Ultimate." C. L.

Moore came through with "Greater Glories"; and Leinster, "Proximi Centauri "(25) and "The 4th Dimensional Demonstrator." The serials, "Blue Magic" (Diffin at 23) and "Twelve Eighty-seven" (Taine tying), together with Gallun's "Derelict" (25) and Bates' "Alas All Thinking!" round out the year.

B. T. Survey for 1936 shows that Astounding printed the two most controversial tales of S-F history (barring "Lo!" and Van Kampen's 'The Irrelevant")—Lovecraft's "At The Mountains Of Madness" and "The Shadow Out Of Time." But the serial and novel came through, however, with 50 and 40 points respectively. Williamson, though, leads off with his 55-point Legion sequel, "The Cometeers." Tied with the Lovecraft novel at number-three post was Leinster's serial "The Incredible Invasion" (40). Juggled for last are Binder's "Spawn Of Eternal Thought," Van Lorne's "Strange City," and Fearn's "Mathematica" (all at 35).

Brass Tacks vanished March, 1937—until the following November. So statistics are lacking for this year. But, from what there is to guess on—"The Galactic Patrol," first of Dr. Smith's Lensman serials, rode into first place on around 80 golden points. Don Stuart's "Forgetfulness" took second, I'd say, with around 45. "Seekers Of Tomorrow" (E. Frank Russel's, at about 30) and Norman Knight's "Frontier of the Unknown" frost off the pie.

Most of us can remember as far back as 1938, I suppose. Number one was, of course, "Who Goes There?"—Stuart's greatest tale, according to Brass Tacks. (60 points.) Williamson's "The Legion Of Time" claimed second at twenty pegs below. "The Master Shall Not Die!" (Miller's 35-pointer) and Gallun's grim "Seeds of the Dusk" tie for third place. "Flight Of The Dawn Star" (Williams with 30) and "Language For Time-Travelers" (de Camp) slip in on the deadline for last notch. De Camp's item hit the top as AS-F's all-time fact article, together with "Lo!" and your own Astronomy series.

In 1939 the publication struck a still higher note—and in 1940 boasted two of its finest tales—but with these highlights on the *all-time* list, let's turn to it.

The most popular story Astounding ever published was Jack Williamson's serial, "The Legion of Space," so—

		Points
1.	Williamson	131
2.	The Skylark Of Valeron (Smith)	120
3.	Rebirth (McClary)	108
4.	The Mightiest Machine (Campbell)	94
5.	Slan! (van Vogt)	90
	Final Blackout! (Hubbard)	90
6.	Galactic Patrol (Smith)	80
	Gray Lensman (Smith)	80
7.	Colossus (Wandrei)	60
	Old Faithful (Gallun)	60
	Who Goes There (Stuart)	60
8.	The Cometeers (Williamson)	55

9.	At The Mountains Of Madness (Lovecraft)	50
	Twilight (Stuart)	50
	Cosmic Engineers (Simak)	50
10.	The Cloak of Aesir (Stuart)	45
	Black Destroyer (van Vogt)	45
11.	Lo! (Fort)	40
	Bright Illusion (Moore)	40
	Incredible Invasion (Leinster)	40
	Shadow Out Of Time (Lovecraft)	40
	Forgetfulness (Stuart)	40
	Legion Of Time (Williamson)	40
	Crucible Of Power (Williamson)	40
	If This Goes On— (Heinlein)	40
12.	Spawn Of Eternal Thought Binder)	35
	Strange City (Van Lorne)	35
	Mathematica (Fearn)	35
	One Against The Legion (Williamson)	35
	Greater Than Gods (Moore)	35
13.	Night (Stuart)	32
	Son Of Old Faithful (Gallun)	32
14.	He From Procyon (Schachner)	30
	Sidewise In Time (Leinster)	30
	Seeker Of Tomorrow (Russel)	30
15.	Spoor Of The Bat (Zagat)	28
	Before Earth Came (Fearn)	28
	The Red Peri (Weinbaum)	28
16.	Greater Glories (Moore)	25
	The Lotus Eaters (Weinbaum)	25
	Derelict (Gallun)	25
	Proximi Centauri (Leinster)	25
	Frontier Of The Unknown (Knight)	25
	The Morons (Vincent)	25
	Universe (Heinlein)	25

Some idea of my logic for halting this list at twenty-five points is that the next *five* numbers have as many titles as the above one hundred and six.

Brass Tacks averaged around eighteen to twenty-five letters per issue—1934 to 1937. Since averaging twelve in 1938 the number has since dropped consistently lower and lower. No doubt this underrates some of the later stories—however, the disproportionate margin is not very great when one remembers the vast "Irrelevant" (pro-con), "Lo!" (pro-con), Lovecraft (pro-con), and SPWSSTFM wars, et cetera, that swallowed paper years ago. Since letters of the "Slan" period were just one half or less considering the 1934 average, one could rate van Vogt's tale and Hubbard's serial at 180 points. But I would not consider this reasonable at all. A good number of the "old classic" points are gathered over the 1935-1943 era by reminiscent readers.

And here's another point. Current "Analytical Lab" reports give no idea whatever of how a story rates against this vast background of old favorites. In other words, a current item is measured only in reference to the ephemeral standard of the monthly quota. How about rating the stories by the number of votes they command instead of by the percentage of votes. Use the whole background of AS-F for a standard, not the approval of just one issue.

The S-F "renaissance" of 1943 was due to the "lean years": 1931-1933. Pent-up theories, ideas, variants, and plots suddenly burst forth from voluble pens. Since the last chapter of "Slan," S-F has tended toward the "lean" again, with Uncle Sam adopting the majority of the "old masters."

When Victory looses the bonds—OH, BOY! what then for S F! 1934 will just be a shadow for AS-F—WHAT THINK?—Walter A. Carrithers, Jr., 463 North 2nd Street, Fresno 2, California.

You just made it. If you haven't time for a letter, we appreciate a rating on a penny post card.

Dear Mr. Campbell:

It's a bit late; perhaps *too* late to be of any use to the Analytical Lab—but none the less here are my ratings on the September Astounding:

1. "Judgment Night," by C. L. Moore. (Part II.) Personally, I thought that the first part was the better of the two—which speaks well indeed for the first part. The ending was good; considering the *idea* involved and not the rather vague writing. Strange, is it not, that the climax, the grand finale, should contain the only writing that I felt inadequate in the whole story? But *quién sabe;* perhaps I am wrong. Taken as a whole, Miss Moore's beautiful tale is sure to be among the top ten of the year. Probably in the first five.

2. "Attitude," by Hal Clement. Excellent.

3. "The End of the Rocket Society," by Willy Ley. This was utterly fascinating; I certainly hope Ley has deserted his caveman articles and come back to science-fictional topics.

4. "Concealment," by A. E. van Vogt. Very good.

5. "Doodad," by Ray Bradbury. Bradbury, although new, is one of my favorite authors. But he slipped mightily on this—mainly because he tried to suit his style to Astounding, seemingly failed, and hence got a new style. I prefer the old style—the serious, even beautiful writing to the clever stuff in "Doodad."

6. "Robinc," by H. H. Holmes. Poor—if Boucher can't do better than this you had better give him a shot of something quick. He can write, you know.

So much for the fiction. Now we come to the true-story department:

1. "Universal Solvent," by Clayton James MacBeth.

2. "And Watch the Fountains," by Ray Bradbury.

3. "You Said It!" by Charles Ben Davis.

Brass Tacks was much too short.—Chad Oliver, 3956 Ledgewood, Cincinnati, Ohio.

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THE FUTURE BRINGS
—in the December Issue—

THE DEBT *by E. Mayne Hull*

The Skal Thing planned to pay off the debt—with death!

LOST ART *by George O. Smith*

The Martians were gone—but they'd left a "complete" manual that left out all the important data.

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